

ELECTRICAL CONTRACTING

March, 1937
Vol. 36 No. 3

With which is consolidated
The Electragist
and Electrical Record

Established 1901

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A SERVICE PAPER for electrical contractors, engineers, motor shops, industrial electricians and inspectors, covering engineering, installation, repairing, maintenance and management, in the field of electrical construction — industrial, commercial, residential

McGraw-Hill Publishing Company, Inc.

Publication Office, 99-129 North Broadway, Albany, N. Y.

Editorial and Executive Offices, 330 W. 42nd St., New York, N. Y.

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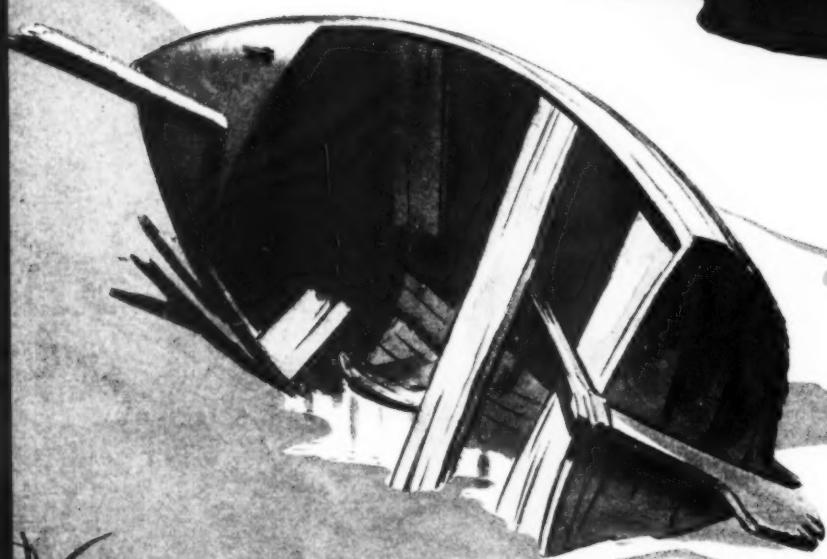
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Branch Offices: 520 North Michigan Ave., Chicago; 883 Mission St., San Francisco; Aldwych House, Aldwych, London, W. C. 2; Washington; Philadelphia; Cleveland; Detroit; St. Louis; Boston; Atlanta. Published monthly, price 25 cents a copy. Subscription rates: U. S. and Canada, \$2 a year; all other countries \$2.50 a year. Entered as second-class matter August 29, 1905, at post-office at Albany, N. Y., under the Act of March 3, 1879. Printed in U. S. A. Copyright 1937, by McGraw-Hill Publishing Company. Cable address: "McGrawhill, New York." Member A.B.P. Member A.B.C.

Weather



ON THE BARREN SHORES of countless industrial rubbish heaps are strewn the weather-beaten carcasses of electrical wires and cables whose protection failed. Derelicts ...because their insulation could not stand the test of wind and water, sun and cold.

RESISTANCE TO WEATHER has long been one of the vital protective elements built into U. S. Tempered Rubber insulating compounds. Developed in thousands of laboratory tests and proved in hundreds of thousands of actual service hours on U.S. Tires and U.S. Wires—resistance to weathering is an inherent characteristic of Tempered Rubber. It is one reason why U. S. Rubber Insulated Wires and Cables offer to the buyer and the seller of electrical conductors a greater measure of real profit.

EXPOSED on the weathering rack! Market samples of cords and cables are here flexed around a 3½-inch diameter and held in a fixed position under uniform



tension. Results of this test—measured by time elapsed before visible deterioration of the surface—give U. S. Tempered Rubber top honors for weather resistance!

United States Rubber Company

United States Rubber Products, Inc.



New York, N. Y.

Wire is only as good as its
Insulation

WHEN YOU SPECIFY **BULL DOG** **SWITCHES** or **PANELBOARDS**

YOU SPECIFY

The Best



SAFETY SWITCHES—The Famous

Vacu-Break Type

Every modern desirable feature is found in the famous new Bull Dog **VACU-BREAK** Safety Switches—stylish compact enclosures—all circuit Breakers Sealed for extreme safety switching—standard ease of installation with **SOLDERLESS WIRE GRIPS**. We sincerely believe Bull Dog **VACU-BREAK** Safety Switches to be the most efficient, most desirable Safety Switches ever designed.

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The most economical line of general use Panelboards. For use in factories, garages, warehouses and similar buildings. Includes the space-saving **NARROW COLUMN** type for installation on columns or pilasters in industrial plants and commercial buildings.

RIGHT—The
space-saving,
Narrow Column
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Superb Lighting Panels

The famous Panelboard, composed of standard units of standard sizes. A truly original creation suitable for restaurants, buildings, office buildings and general installations. Costs no more than panelboards of ordinary appearance.

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Manufacturers of Safety Switches, Enclosures, Light and Power Panel Boards, Switchboards, Dist. Systems

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BULL DOG ELECTRIC PRODUCTS OF CANADA, LTD. TORONTO, ONT.

Why Sleep on Cinders?

BELIEVE IT OR NOT American factories are way down at the heels. In 1935 over 65 per cent of the machine tools in use were older than ten years—and obsolete. In 1930 the percentage was 48. In 1925 it was 44. Electrical equipment is just as bad. Wiring is worse.

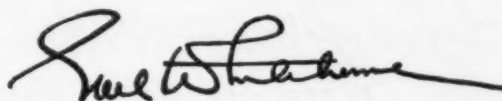
MAYBE THIS DOES NOT MEAN ANYTHING to electrical contractors and motor shops and plant electricians. But I think it does. For why should a man sleep on cinders, when silver dollars are lying around loose ready to buy soft beds?

FIRE AND SWORD COULD NOT COMPEL the modern manufacturer to quit using electric light and power and heat and control. But they muddle along with ill-chosen or outgrown or worn equipment that raises hell and wastes money. And it is our fault. We know. They don't. And we don't show them.

ALL THIS ELECTRICAL OBSOLESCENCE in industrial, commercial and institutional buildings can be put in the spotlight anytime we want to go to work on it. This whole vast volume of profitable opportunity is only waiting for us to start talking, provided we will stop telling manufacturers what they *ought* to do and show them what they *want* to do. It is as simple as that.

FACTORY EXECUTIVES ARE NOT INTERESTED in line losses, in voltage drop, in power factor, in foot candles—as such. They *are* interested in continuous production, in preventing accidents and spoilage and in operating efficiency. And the relation of all this to weak spots in the electrical system is easy to demonstrate.

THE KEY TO THIS WHOLE SITUATION lies in the use of instruments. Tests talk the language of management. They tell the head man not what we want him to do but what he *is* doing. And if he is doing wrong, he sees it and that's that.





*To make profit
dollars, sell:-*



THE ECONOMY OF BETTER LIGHTING



THE COMFORT OF MODERN WIRING



THE TIME SAVING OF SIGNALING



THE EFFICIENCY OF UP-TO-DATE POWER



THE USEFULNESS OF ELECTRICAL TOOLS

BUILDING reports show construction of all kinds steadily increasing.

Alert electrical contractors will *not* be satisfied with the limited share of this business that comes to them. Instead they will *expand* their share by selling electrical *usefulness* and *long-term economy*. Their selling will show that better lighting increases production...electrical signaling saves time...modern wiring and power layouts are needed for efficiency. Thus creating profitable business for themselves.

To such contractors, Graybar offers an experienced, convenient source of any and all electrical supplies...geared to the contractor's needs. Plus a 68 year reputation for dependable, quality products.



*Everything electrical for all
types of CONSTRUCTION...*

GraybaR

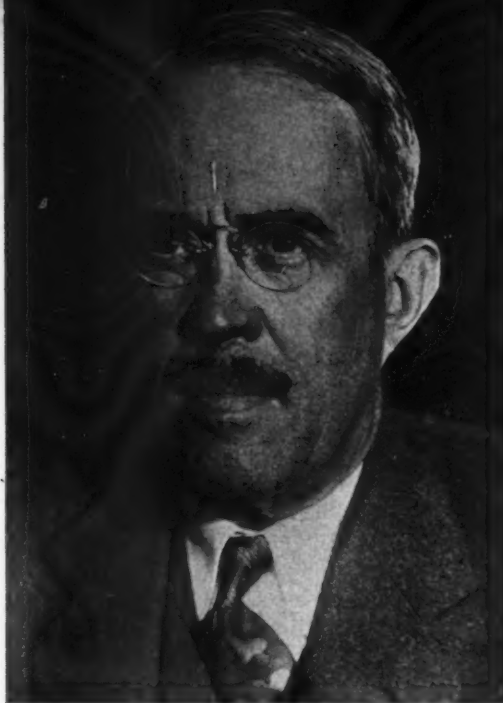
OFFICES IN 80 PRINCIPAL CITIES

EXECUTIVE OFFICES: GRAYBAR BUILDING, NEW YORK, N. Y.

No JERRY Wiring!

A Two-Fisted Statement from R.E.A.
on the Rural Wiring Problem.

A Frank Endorsement of Quality Wiring
and Good Workmanship



By Morris L. Cooke

Administrator, Rural Electrification Admin-
istration, Washington, D. C.



WITHOUT FRILLS—This kind of low cost
pole construction has been promoted by
R.E.A. for rural areas.

I am concerned over reports I keep getting that REA favors shoddy, jerry-built wiring jobs on farms. I hear that REA prefers to see farm wiring done by a bank clerk with a pair of pliers, rather than by an experienced electrical contractor. This is not true. I have yet to see an REA statement which does not counsel prospective customers of rural lines to be sure their wiring is both safe and adequate. We want no fires and no regrets.

As we see it, the rural electrification movement is creating a series of new problems and demanding as many new answers. Electricity has hitherto been primarily an urban commodity. So was the automobile in its early days. But the automobile industry quickly developed techniques to meet rural requirements and electricity can and must do likewise.

We have made a start in the construction specifications of the rural distribution lines themselves. Two years ago the rural line was nothing but a city line moved out into the country. The heavy, battleship construction, the double-braced cross arm, the elaborate hardware and the short span, commonly found in cities, were holding rural line costs way above what they should have been. Rural lines frequently cost between \$1500 and \$2500 per mile.

Today we have sturdy low cost rural line construction specifications, designed for country use, and averaging under \$1,000 per mile. The spans are long, the cross arms have largely disappeared and superfluous hardware has been eliminated. What's more, these new lines are standing up under winter sleet and ice and the impact of hurricanes.

The same principle is going to solve the knotty problems of wiring, but it is going to take a high degree of cooperation between the utility industry, the contractors and the Government, and it is not going to be solved overnight. If we fail to offer the farmer good wiring at prices and on terms which he can meet, he is going to continue the pursuit of what we know to be a false saving in initial costs.

No farmer wants a hazard on his place, and no farmer wants to spend more than he thinks he has to. I believe the answer lies between these two points. We have got to demonstrate the meaning of safety and then we must evolve techniques which will enable us to offer safety at a reasonable price. I don't want to get into a technical discussion here, but, to pick an example at random, we all know that knob and tube has a place on the farm which it does not have in the city. There are

ENDORSED BY CARMODY

This article was written. Then Morris Cooke resigned. But R.E.A.'s attitude remains the same. The new administrator sends this endorsement—

"I heartily support the principles and policy expressed in this statement by Morris L. Cooke."

JOHN M. CARMODY,
Administrator, R.E.A.



RURAL CONTRAST—Beside the power company's handsome meter, we see here, jerry wires passing through the wall, hand-wrapped in cast-off inner tube. But they enter the barn from the knobs, over the window, with no extra protection at the holes.

plenty of other examples, but specifications alone are not the whole answer.

The most promising field in which to seek savings in costs seems to me to be group wiring contracts. If a contractor can line up all the houses on a given road and do all the wiring jobs at the same time, he can effect substantial savings both in his selling expenses and in labor time. And by far the majority of the rural wiring jobs are going to come in groups, as new rural lines go down the road.

I am speaking very frankly, because I recognize both the difficulties and the social importance, which are tied up in this question. We, in REA, have a part to play and so have you as contractors. Frankly, I do not think either one of us can lick this alone. We must stress the need for safety and adequacy, at every turn, and you must develop new ways of getting costs down, without sacrificing safe wiring.

In conclusion I have a request to make. If any of you hear it said that REA condones dangerous wiring, look up the author and tell him he is wrong. If he won't believe you, I should appreciate a letter and an opportunity to state REA's true position.

NEW WIRED HAND—This Ohio farmer has just secured light and power, and it's well wired as R.E.A. has urged.



Rural Wiring

Snapshots of some Fancy Co-op Construction Fresh from Kansas Farms—with Notes on Photos as Penned by a Kansas Contractor

A Kansas contractor took a look around not long ago to see how the handy men were getting ahead with their wiring, down on the farm. What he saw was so interesting, that he made pictures of a few outstanding features. Here are some of the choice ones.

When these snapshots were shown to Morris L. Cooke, head of the Rural Electrification Administration, in Washington, he was astonished and dismayed. He pushed a lot of buttons, to find out whether any Federal funds had been loaned on this new rural line, where these old farm buildings have been recently wired. Mr. Cooke is an electrical engineer and knows what it is all about. To his relief, he found that this particular rural development is an independent farmer's cooperative job. R.E.A. has not been involved in anyway whatever.

So we asked him to make a straightforward statement to the electrical contractors of the country and tell them what R.E.A. policy is in the matter of all this jerry wiring that is being installed by plumbers' helpers, garage mechanics, bank clerks and other dexterous amateurs. For Washington is not unnaturally being blamed for it.

The statement, as written by Mr. Cooke, is presented on the preceding page. It is official and binding. R.E.A. declares against jerry wiring!

As a matter of fact R.E.A. has already gone on record for safe construction, for inspection and for work done by the competent, qualified contractor. Many printed statements declare this definitely. Quite properly they also urge that farms be wired in groups—so many at a time—so that the contractor can get his costs and his prices down and still make a profit.

Hereafter when you hear some farm co-op enthusiast or some over-zealous Washington representative telling the farmer, that anybody can do his wiring, show him this statement and these pictures. Tell him that good wiring costs money, like good milk cows or good motors cars. Explain how good wiring insures safety, dependability, convenience, service, economy.

And if the handy man starts his dangerous work, talk to the insurance agent who holds the policy on that farm and the local banker who owns the mortgage. Show them these pictures. Tell them that R.E.A. warns them against jerry wiring—it burns down good farm homes and barns!

Save these pages! Show them to the farmers when the rural lines go through. It will help you sell!

Electrical Contracting, March 1937

New Rural Service
west side of house



WEATHER BREEDER—Here meter, switches and fuses are tucked comfortably away under the overhanging roof. But Kansas storms come from the west and make whoopee in protected spots like this.

Service drop from pole



WHAT NOT TO WEAR—This service drop from the farmer's pole lies unprotected across the roof, where it ends against the edge of the tin—or is it tarpaper? And narrowly misses the iron gutter.

Gone Wrong!



STORM BOUND—This meter with its 30-amp. fuses, and these service wires, are located beside the front door, within reach from the ground. The lead in wires are loose and already pushed together. All are located at the northwest corner, exposed to the prevailing storms.

POLE TROUBLE

—From this busy rural pole, the service drop takes off with no insulators and bare joints, to see what it can do for this farmer—or to him.



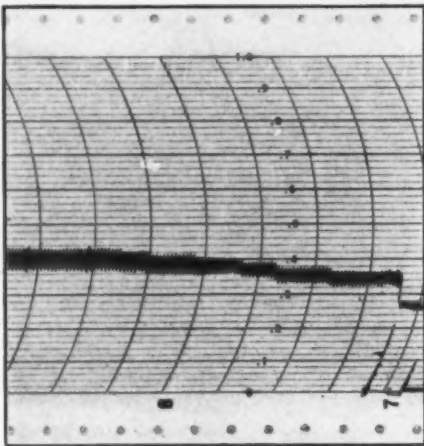
PRIZE IDEA—Here is genius! —Armored cable on cleats, runs across two windows and under a shutter, conveniently open, then past an aerial.



HOT SWITCH—This system leaves the power company's construction via a composition switch with hot blades. Then it does a corkscrew up the walls and crawls in through tubes.



POULTRY HAZARDS—Here we have knobs screwed to a cleat on a tree. Joints are not taped and bare wires run under the eaves and enter the hen house.



POWER WASTE—was run down after this chart proved what happens when blower ducts of idle woodworking machines are left open. Power load increased as more ducts were opened.

Instruments Bring Orders

This contractor hunts for motor and control troubles in industrial plants, finds the facts and gets the business

THERE are three kinds of salesmen who clutter the reception rooms of business. First comes the fellow who just wants somebody to give him an order. Then there is the one who thinks maybe something ought to be done to improve or correct a condition, but he hasn't anything doped out that proves his point. Then we have the fellow who really digs for facts, and then tells the man behind the check book, "Here is what this will do for you."

So we come to the case of Nils Furst of Long Island City, N. Y. He has learned how to gather facts with electrical instruments. He goes out and proves what he can do for his customers. And so, the manufacturers of that complex industrial area keep the Furst Electric Company, Inc., busy all the time, in both construction and motor repair departments.

In the days when business was at rather a low ebb, Mr. Furst saw a need for some "pump-priming" of his own. It cost him about \$400 to get set with tools that would help him sell. In other words, he bought a graphic wattmeter complete with accessories, also a tong tester for making quick indicating measurements. Those tools have been kept at work ever since and have proven themselves worth their keep.

Some typical cases that were picked out of this company's files at random are given below. These show at a

glance some of the common problems that existed in various plants, some for a period of years. It has been possible to ferret them out, and make a fact-giving report only because the proper instruments were available for use. But when the facts were properly presented an order resulted.

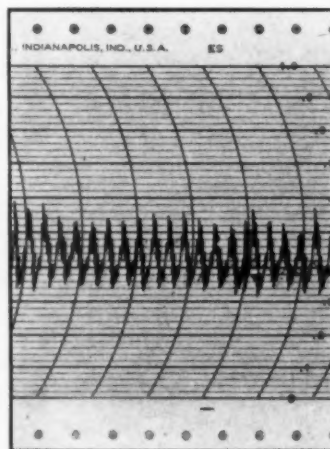
Case No. 1—Woodworking Plant: A 30 hp. motor driving a blower was wearing out \$70 belts at a disturbing rate. Readings were taken which revealed excessive belt slippage. The 30 hp. motor was also found to be pulling 36 hp. A 40 hp. motor and pivotted base was sold by Furst to-

gether with a nice re-wiring job when the facts were revealed.

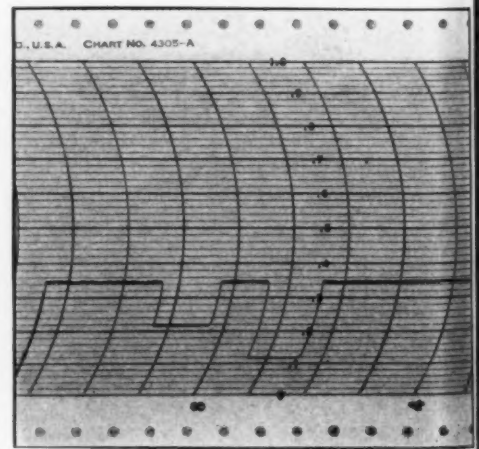
Case No. 2—Paint Factory: This company complained about its power bill, but a power company's test of their meters showed them to be accurate. A test was made by Mr. Furst where two line shafts were driven by 30 and 10 hp. motors.

The total load for both line shafts was found to be only 6 hp. These shafts were therefore tied together and are now run from the 10 hp. motor. The 30 is now available as a spare for future increased load.

No direct sale resulted here. How-



BELT SLIPPAGE—was revealed by this chart of an overloaded 30 h.p. blower drive. (Case No. 1.)



CORRECTED CONDITION—Chart shows improved power curve after installing a new 40 h.p. motor and pivotted motor base. (Case No. 1.)



NILS FURST—A Long Island City contractor and motor specialist, uses instruments. This recording wattmeter, he says, is his best silent salesman.

ever, this company has since given Mr. Furst a lot of small wiring and maintenance work on open order, while they formerly were known as "shop-pers."

Case No. 3—Wire Rolling Mill: Excessive heating of a 60 hp. roll drive motor and its controller was found to be caused by frequent starting and stopping of this machine to permit adding new coils of wire. When the actual conditions were disclosed by Mr. Furst with his recording wattmeter, the trouble was quickly remedied and production also speeded up. This was done by installing a welder for

splicing the coils of wire to permit continuous operation of the roll. The chart tells the story.

In this case, the motor was found ample, controller maintenance costs were considerably reduced and Mr. Furst made staunch friends. An order for the welder installation was the beginning of a profitable customer relationship, amounting to \$1500 in open orders since that time.

Case No. 4—Woodworking Plant: Wasted power resulting from the careless manipulation of the duct openings in a blower system in this plant was revealed by a chart. The company

thought a larger motor was necessary to do a better job of carrying off waste from planers, rip-saws, molders, sanders and jointers.

Mr. Furst conducted a test which revealed excessive belt slippage. A pivotted-base corrected this condition and the charts then showed the motor to be of ample size. By charting the increase in motor load, as more ducts were opened at various machines, the management quickly learned to save power by requiring that duct openings be kept shut off at idle machines. More goodwill.

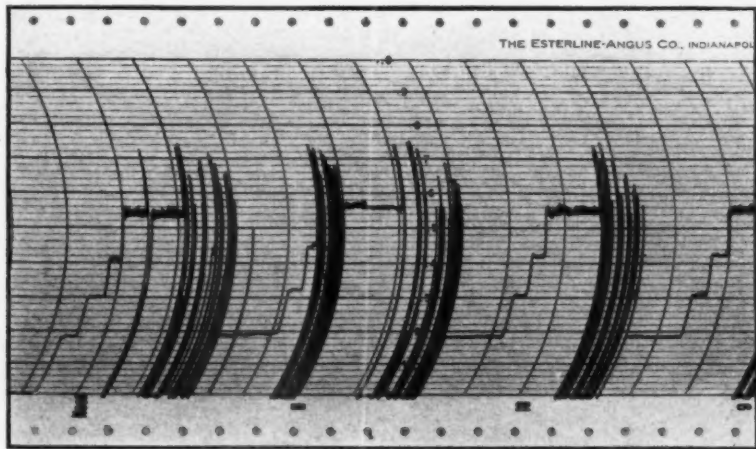
Case No. 5—Radio Set Factory: Two line shafts, in the metal stamping room, had 5 and 10 hp. motors. The 10 hp. motor was connected to both lines and a chart reading, that was taken over a prolonged period of peak production, proved this motor ample.

Lots of changes are being made in this factory, some being modernization ideas suggested by Mr. Furst. And all this work is on open order.

Case No. 6—Magnesium Plant: A bucket drive was stalling at intervals, although a chart reading proved that its normal load was well within the motor's rating. Although the management was ready to re-motor this drive, Mr. Furst wanted to know all the facts.

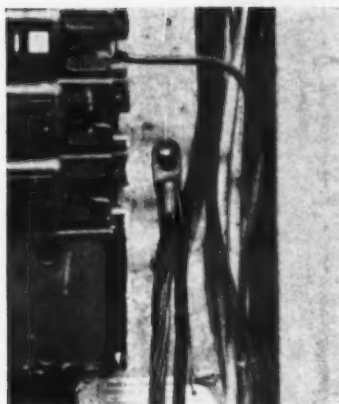
Stalling was found to be caused by pieces of flint becoming jammed in the teeth of the chain drive for this equipment. Here over-powering would have caused serious damage to the jammed machinery. Mr. Furst's facts led to mechanical improvements that keep the flint out of the magnesium powder. Another friendly service that made a solid customer.

Rule-of-thumb methods have no longer a place in the sales kit of an industrial contractor, according to Mr. Furst. With the proper instruments it is possible to check up on many puzzling conditions that occur in day-to-day sales and engineering work. Facts promote confidence. Intelligent analyses and surveys promote good will. All this means more orders at a profit.

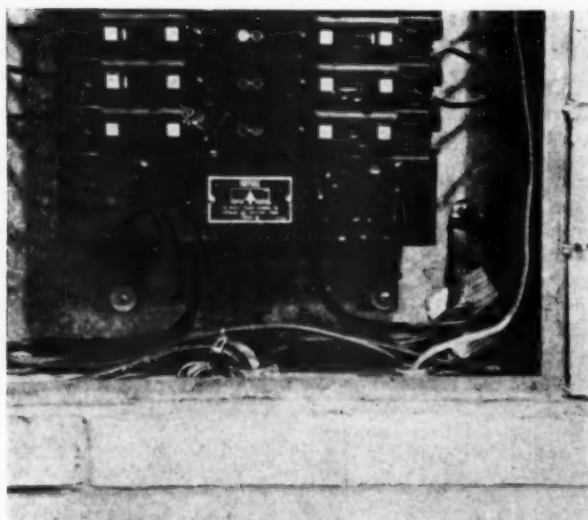


FREQUENT STARTING—of a 60 h.p. wire roll drive was a source of trouble—and unnecessary. This chart caused production methods to be improved. (Case No. 3.)

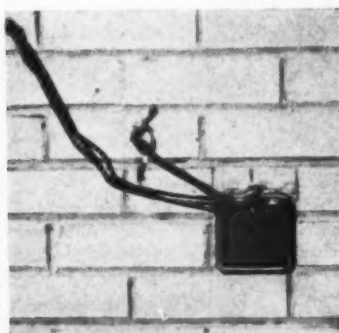
SuperG



PANELBOARD CABINETS—Grounded by 1/0 bare copper taps or risers, secured to the cabinet with bolted-on solder lugs.



IN CABINETS—The bare conductors enter through a regular knock-out, routed to each location during the concreting and wall-building stages of construction.



GROUNDING TAP—A 1/0 tap or riser was brought out at the outlet box for wall-mounted controllers and switches.

Concealed Network Of Bare Stranded Copper Parallels a Grounded Conduit System Throughout a New Youngstown Building

IN wiring a new service building for the Ohio Edison Company at Youngstown, the Carlson Electric Company recently installed a parallel system to take care of equipment grounding. Adequate paths for the flow of accidental ground currents are provided by concealing bare stranded copper grounding conductors, tapped off to connect with 52 panelboard cabinets and all the motors in this modern fireproof building.

A system of exposed bare copper bus bars was used for grounding the frames and the neutral point of the transformers within the indoor transformer station. Six driven grounding electrodes, a buried ground plate and a connection to the street water mains were all bonded to this bus bar system with 4/0 copper. From the transformer station a complete loop of 4/0 bare stranded copper was run concealed around the outer walls of the building. Taps and risers of 1/0 copper were made from the 4/0 loop to reach individual panelboard cabinets, motor controllers and other equipment throughout three floor levels of this building.

About 1200 ft. of 1/0 and 400 ft. of 4/0 bare copper was required for this grounding system. The accompanying photographs and schematic diagram show how this material was installed and connected at various points in the building.

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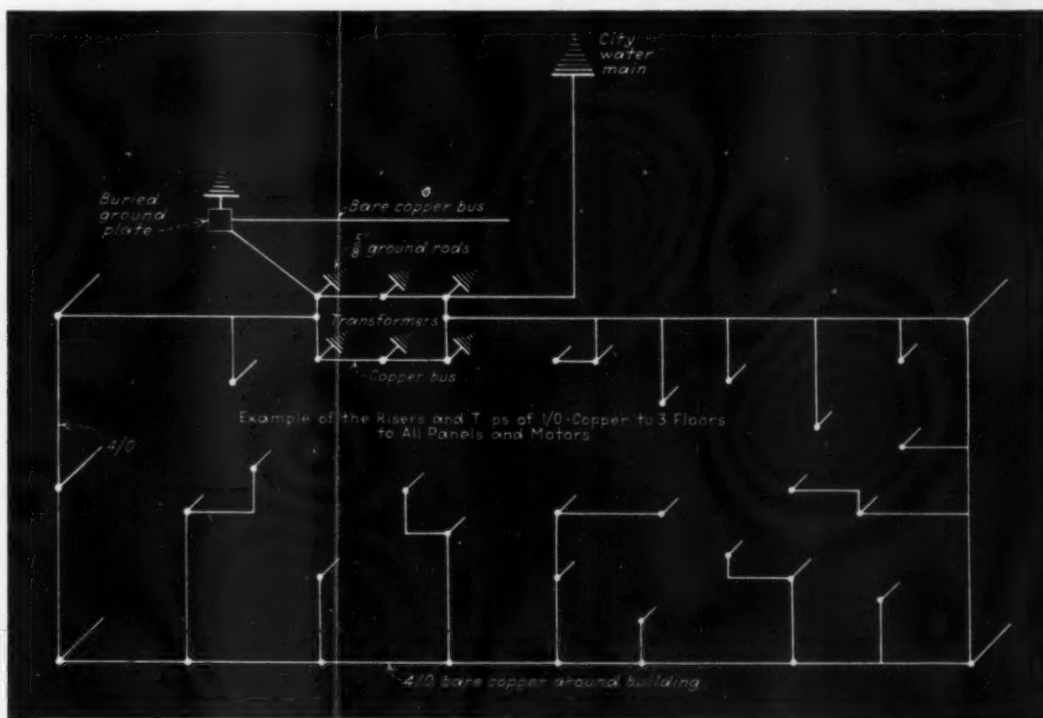
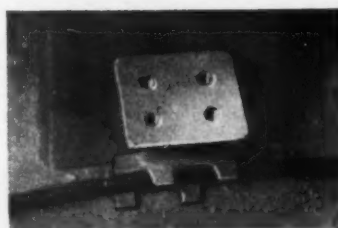
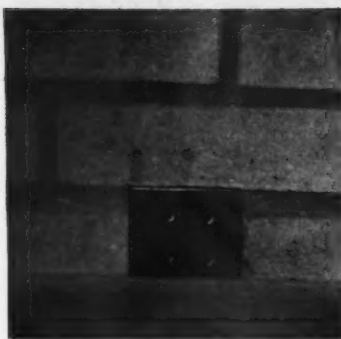
rGrounding



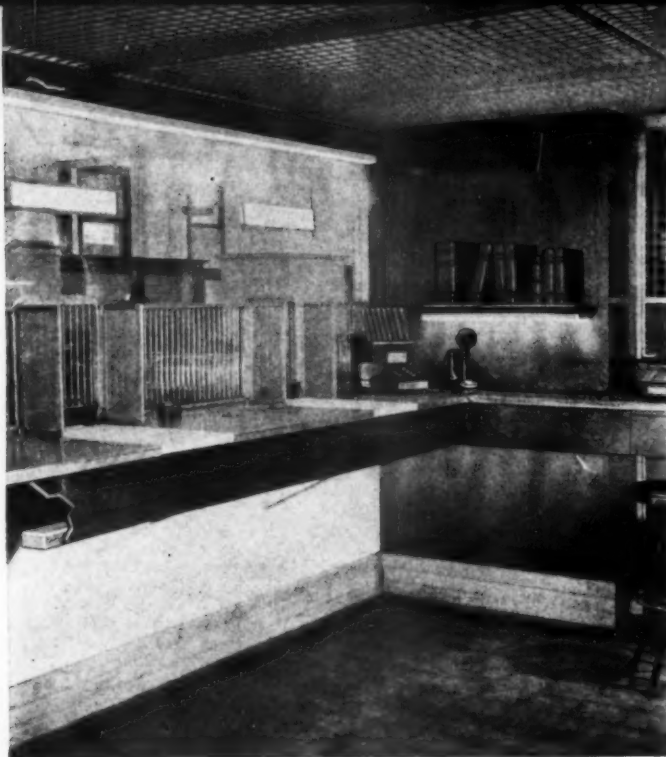
FLOOR AND BASEBOARD — (Above) Ground connections were made with special tapped connecting plates set flush. This left no unsightly projecting leads at outlets for future equipment.

BOLTED ON—(Left) Switches were set over flush outlets and the grounding lugs bolted on outside or inside the metal case, as was most practical.

BRASS INSERTS—(Right) Flush connecting plates provided four $\frac{3}{8}$ -in. tapped holes for receiving lug bolts. A grooved projection, with ears, at the back soldered on to the bare conductor.



GROUNDING NETWORK—A 4/0 bare conductor was run concealed in the masonry and concrete around the entire building. Taps of 1/0 copper connected all equipment at various locations through scattered risers run in partitions, and looped through various cabinets.



In a Bank—Special uses to help the bank clerk count money, use the phone book and pick up coins that drop onto the floor.



Post Office—Lumilite in a post office gives even light at sorting tables, continuous distribution and no glare.

FUNDAMENTAL changes, such as in the shape of a lamp, naturally lead to the appearance of special lighting equipment, new ideas in installation, and new effects in illumination. The coming of continuous linear light is a good case in point. It immediately suggested interesting departures from the customary pendant luminaires, wall brackets and pedestal lamps. Out of it have come new applications of case lighting, recessed lighting and all kinds of built-in and built-on lighting, where Lumiline tubular lamps have special advantages.

It is a simple matter also to call to mind the many places where a single Lumiline lamp is useful; over a mirror, for instance, in a door cap, above a sink,

or in other judiciously chosen spots which require a little direct light from an inconspicuous source. But it is the medium sized installation that offers the most attractive opportunity for the contractor. There are many more prospects to be sold, and incidentally, this is the field so far least exploited. Also there are many specific lighting problems for which round lamps are inappropriate, that may now be satisfactorily solved by the use of these tubular lamps. Such new lighting possibilities, of course, mean more wiring, more outlets, more equipment.

To make it easy for the contractor to use the Lumiline lamp in distinctive installations a special channel, the "Lumiline light strip," has been devel-

oped. It is a bright aluminum reflector, complete with receptacles, brackets, lamp holders, and reflector plates. It may be made up to any length, with outlets spaced as required for the job, and the Lumiline lamps snap into their receptacles, which makes lamp replacements easy. This flexible channel can be used in a horizontal position or circular effects may be obtained by jointing the sections. The reflecting surface of the channel produces a continuous strip of light, free from splotch effects.

Used in Coves

An equipment of this type, of course, can be used in a great variety of ways, some of which are shown in the accompanying pictures.

Where space is limited or low surface brightness is desired, small coves and mouldings can be sometimes built to conceal a unit or two of Lumiline. A cove under the rail along a stairway, or over a sink or over a cabinet or display case will give the needed light with a touch of distinction. Coves over the door cornice and window valance are also effective.

Also Built In

Lighting can be built in economically and easily in the same manner over altar alcoves, ticket windows, telephone booths and architectural niches by placing an inconspicuous strip of wood across the top of the alcove to hide the light. This method of cove lighting is particularly useful in dressing rooms of clothes shops where good lighting



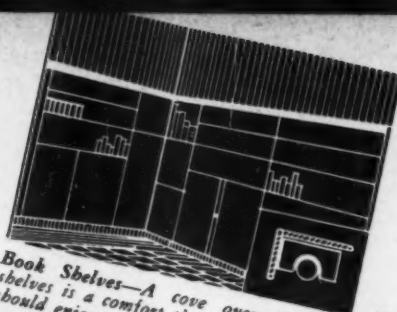
Stair-rail—Lumilite in a cove brings tale and a touch of novelty.

Places To LINEAR

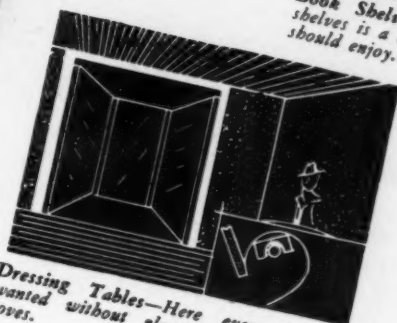
To Sell LIGHTING



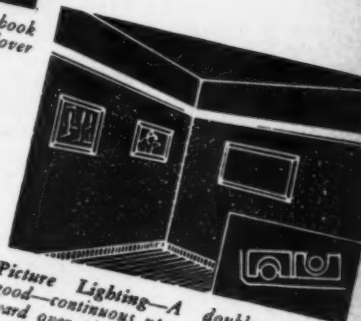
Cornice Coves—A bit of indirect lighting may be added by Lumiline on the door and windows.



Book Shelves—A cove over the book shelves is a comfort that every book lover should enjoy.



Dressing Tables—Here even light is wanted without glare—Try Lumiline in coves.



Picture Lighting—A double cove is good—continuous upward light and downward over pictures.

is necessary and space is usually scarce. The coves may be placed above or at the proper angles on the sides of the looking glass, with all glare on the mirrors. This shows the materials in an advantageous light, and makes the customer's face appear to advantage—which helps the selling. Its use for wall and counter cases and to silhouette advertising letters above wall coves is well known, and behind flashed glass panels in cocktail lounges and restaurants.

For Libraries Too

Other instances, where built-on equipment of this type solves the problem very well is in small libraries and picture galleries. Here if the Lumiline equipment is extended well out from the surfaces of the stacks or the pictures, to be illumined, evenly distributed light is obtained with no glaring lamps to the eye of the observer. In the case of galleries, the avoidance of reflections on the picture glasses is an important factor. The general indirect illumination will be sufficient to compensate for the effect of the direct light over each picture and do away with reflections.

This treatment brings a new touch of decorative illumination that is in harmony with the "streamline" spirit of modern interiors. It is so flexible that it may be used to emphasize the architectural features of any building. The contractor's customer, therefore, can obtain effects that are individual. And this, of course, opens the door to the modernizing of many installations, where re-decoration rather than increased illumination is the need.

Electrical Contracting, March 1937

By M. R. Matteson

Curtis Lighting, Inc., Chicago, Ill.



Cocktail Lounge—Hotel Hill, in Omaha, uses Lumiline in coves and the light is soft and pleasing to the customers.

In a Store—New show cases come equipped but there are many old ones waiting in many stores needing light.



JOB CONTROL—A corner of another job office at the new annex of the Library of Congress.



JOB OFFICE—McChesney opens a branch office for each job. This one is at the new monumental building for the Federal Reserve Board, in the Nation's Capital.

Looking In on Bob M

Number One in a Series of Informal

By Earl Whitehorne

IF this was a bedtime story for young contractors—but it is not. Anyway, I would begin by saying that the best thing about this business of electrical construction is the opportunity that's in it. If a man has ambition and initiative and judgment and likes to work he can grow and prosper and get a lot out of life. Look at Bob McChesney in Washington.

He started as a helper—at the bottom. Now he is head of Harry Alexander, Inc., in Washington. He handles the work in the big government buildings. He is at the top and still a young man. And he has done it with his own hands. It's a great story.

His First Job

Robert W. McChesney was born in the National Capital forty-six years ago. In 1904 he got a job with the Western Electric Company, as an apprentice—a helper. He became a journeyman electrician and belonged to the union and in 1911 went with Kluckhuhn Bros., and after a while they made him a foreman. In 1914 he joined the W. G. Cornell Company as a foreman, and worked for them five years, becoming manager of their Washington electrical department. Then

in 1918 he stepped out. He opened a Washington office for Harry Alexander, Inc., the big New York firm. His title was district manager.

Kluckhuhn did all kinds of work—homes, apartments, stores, office buildings. Cornell handled larger jobs. McChesney, now on his own, took what he could get but his eyes were on the big stuff. He had no help except a girl in the office and when he pulled down a contract, sat up nights and made the drawings, then hired his labor and put it through. He worked like a horse. He was thorough, accurate, capable and had nerve enough to tackle anything. He got ahead.

Two years later he became a stockholder and vice-president of the Alexander firm. In 1929 he bought a larger interest and was made executive vice-president. Today the company is approximately 90 per cent jointly owned by McChesney and C. M. Nunoz, the president, who runs the New York end.

Now Top Man

So here is your helper, your mechanic, now top man in an engineering-contracting firm, operating anywhere on the east coast, from Philadelphia to the Gulf, and specializing

in big work—monumental buildings, theatres, department stores, office structures or large new factories. It is all specially designed, custom made. For example, he wired the new U. S. Department of Commerce Building. It took three years. The new Interstate Commerce Commission and Department of Labor Building ran two years. He wired the Richmond Federal Reserve Bank and the Olympia Theatre in Miami.

Right now, he has in process the new Annex to the Library of Congress a three year job; the Federal Reserve Building, the Home Owners Loan Corporation Building, and is putting new substations in the U. S. Capitol and the Senate and House Office Buildings. This is a five months' job but actual installation was started Dec. 15 and completed Feb. 5, with no interruption in service and the new switch gear in the same space as the old. And there are several other big ones under way. Contracts for the jobs mentioned ran from \$150,000 to \$1,000,000—big stuff—sure enough.

How does he do it? Well, he is set up that way. McChesney like other big contractors, runs his business out of an office building. He has a permanent organization of 26 people, including four senior engineers, who



ROBERT W. MCCHESENEY—He lifted his young eyes to the bills. Now from this corner in the Investment Building, the Washington organization of Harry Alexander, Inc. gets its orders and their inspiration and their pay.

McChesney

Visits To Interesting Contractors

estimate and plan, a purchasing agent with an assistant, six junior engineers who are used on the jobs and in general technical work, and ten trained job superintendents. At the general office there are engineering, estimating, purchasing and clerical departments and a superintendent of construction.

Look in the Washington telephone book and you read—

Alexander, Harry Inc.
Elec. contractors Investment bg.
National 1536

Branch offices
Federal Reserve Board bg.
District 3488

Library of Congress Annex
Lincoln 9794

For each job they set a branch office, erect a building and the job superintendent takes charge, with a junior engineer to help him. He hires his own foreman, time keeper, clerks and labor. They move in with the plans and specifications, materials are delivered and the work starts. The general overhead for sales, engineering, supervision, purchasing and financing is centered at the main office. But all job expenses, including incidental draughting, all operating paper work, every detail of carrying out the actual installation, is handled in the job office.

If it was concentrated at headquarters, overhead would run 100 per cent

and somebody else would do the job. McChesney stresses the importance of this point and says that this is something that the contractor accustomed to smaller operations often overlooks. He attempts to handle a big job as he would his ordinary work out of his headquarters, loading into his ordinary overhead much work that should be handled as a local job expense. It is worth studying.

How He Learned

All this Bob McChesney has built up out of his apprentice training. He went to no college, save that great American University of Hard Knocks. What he has, he has won with his two hands and his good head and his persistent labor. But he is educated—make no mistake—for he has studied without ceasing and learned the business of construction engineering and—what is even more important—to know men. With six branch offices in operation at this moment, he is busy. He personally visits all jobs in Washington each week and out of town jobs once a month. And work of this kind makes heavy responsibilities and innumerable problems.

Men about him speak of how hard he labors. He shirks no necessary detail, no matter what the cost in

time and effort. He sticks at it late into the night when there is cause. He is methodical, painstaking, cautious, exacting, precise. There is a sign on his office wall that says "What are the Facts?" He may not often look at it but it reflects a mental attitude. He weighs his problems and is deliberate in reaching decisions, but 99 per cent of the time, they say he's right. He has to be. He is a good executive, modest, frank, above-board in all things, easy to talk to, likeable, highly respected.

Beyond His Work

With all of this you would think Bob McChesney would have no time for anything but his own job. But like so many other men of capacity and power, he has not stopped at that. He is a member of the N.E.C.A. executive committee for Pennsylvania, Delaware, Maryland and the District of Columbia, and treasurer of the local N.E.C.A. chapter, and a past president. He was long a member of Local 26, I.B.E.W., and has been active in local association work since its beginning. Not long ago he was instrumental in organizing the smaller contractors of Washington, to help them to enjoy the benefits of cooperation. He has been an officer of the local electrical league and very active in the Institute of Electrical Contractors; also a member of the American Institute of Electrical Engineers, the International Association of Electrical Inspectors, the Electrical Industry Promotion Committee, the Washington Board of Trade.

McChesney also knows how to relax. He is popular socially. He belongs to the Early Birds Breakfast Club, the Calvert Club, is a past president of the Cosmopolitan Club, a governor of the Columbia Country Club. He plays golf and does that too with precision and scores in the low 80's and sometimes in the 70's—which is hard on other men. He shoots geese on the Eastern Shore of Maryland and belongs to a duck club—and God help the ducks! On the side, through all this, he has raised a family of four children—and already they have enriched him with three grand children—which is as it should be.

So much for Bob. And any time you get to thinking that you have no chance to rise and prosper in this glad young world, just think about McChesney of Washington. And then I have a personal suggestion—Go take a good look in a mirror.

Records Pay IN Motor Shops

A New England Company
Has a System
That Saves Money on Every Job

By Paul Keating

Engineer, Electrical Installation Co.,
Cambridge, Mass.

MOTOR rewinds come in such variety that they are more or less tailor-made operations. Usually a motor repair mechanic prepares insulating materials piece-by-piece, to fit various coil and cell dimensions. Meanwhile, the shop owner hopes that good judgment and reasonable care will be exercised to hold the waste of material to a minimum.

But in the shop of the Electrical Installation Company of Cambridge, Mass., the individual mechanic works from specifications. He is relieved of the labor and responsibility of determining the sizes, kinds and amounts of wire, insulation, sleeving and other materials needed. For this has all been carefully worked out, over a period of years, for a wide range of motor sizes of different types. And all the important points are covered in this company's procedure to keep production uniform, to cut down wasted material and to reduce human-error in everyday operations.

Each job is started on its way through the shop with definite instructions, through the use of several records and shop forms. They cover—(1) coil data, (2) type, number of pieces and dimensions of insulating materials, sleeving, cell envelopes, etc., (3) impregnation and baking schedule, (4) mechanical repair list, (5) bearing dimensions, and (6) testing standards. These details are supplied for the job from master records kept in the office, where they are indexed as to motor types and sizes.

Each new type of motor that comes in is carefully checked and a master specification card is made up from the data files. As a result, it is possible for the office to give standard instructions and for the shop to follow a uniform procedure whenever one of these special jobs comes in. Verbal orders are taboo, and the responsibility for every important detail is fixed by written instructions. When final tests are made, the shop superintendent has all the records before him to approve the completed job on the basis of normal performance requirements.

Here then, clerical time is substituted for the time usually consumed by mechanics and by the shop superintendent, in planning and experimenting. Furthermore, every kind of material commonly used in motor repairs is requisitioned for exactly the right gage and dimension. Also, the stock room clerk has less confusion in re-filling or substituting orders, that would be otherwise turned in through mistakes in judgment. Likewise, any special job that comes through receives whatever extra insulation, impregnation or baking that may be specified as a regular procedure and without extra follow-up by the shop superintendent.

If the superintendent or certain key men are out of the shop, the rush jobs need not be delayed. Work goes on as usual, because through years of experience, standardization data has been put on record that speaks for itself in every emergency.

1

D.C. TESTS—A permanent record of important characteristics, often referred to where large machines are involved.

2

A.C. TESTS—Details are reported on this form for comparison with normal ratings.

3

MECHANICAL DETAILS—Repairs on replacements are reported separately from the winding data.

4

FOR A.C. REWINDS—Workmen receive this specification typed in complete.

5

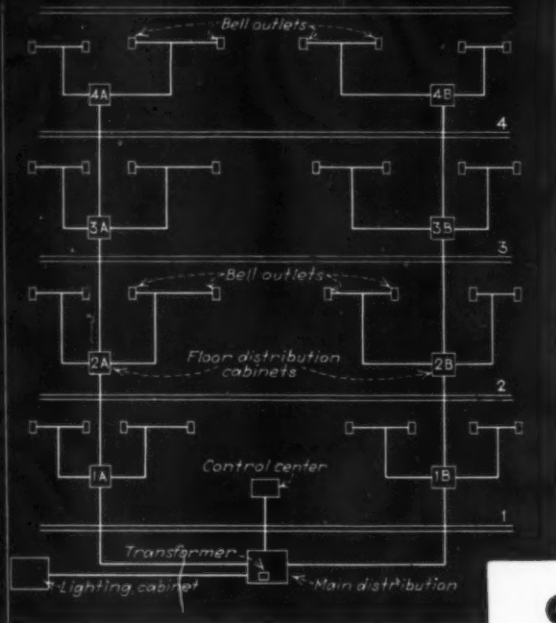
BAKE OR DIP—Impregnations, bakings, and periodic megohm tests are reported for each job, all designated beforehand on this form.

6

FOR D.C. REWINDS—These reports cover every important detail, with the job laid out fully in advance.

7

MASTER RECORD—It gives standard dimensions of winding supplies, test data and average labor breakdown and the usual equipment information.



SIGNAL LAYOUT—Typical distribution for low tension signal system, showing load center cabinets on different floors.

Low Tension

Working Rules and Data

For the Installation of Modern

Signalling and Communication Systems

SATISFACTORY service is only obtained for signal systems, when consideration has been given to the design of circuits. These systems include annunciators, bells, burglar alarms, clocks, audible paging equipment and relays. One of the greatest sources of trouble in low tension signalling may be traced to wires which are insufficiently large.

The selection of proper wire sizes is based on practically the same principle as that followed in lighting circuits.

The chief difference lies in the lower voltages used, such as 6, 12 or 24, and in the greater voltage drop permitted.

The drop is usually 10 to 25 per cent, depending upon the type of apparatus to be used. While in some cases it has been found possible to even exceed this drop in voltage, it is not recommended, because the efficiency of the apparatus decreases. The wire must be of sufficient size to deliver the correct operating voltage at the terminals of all apparatus. Much of the equipment, with which the contractor or plant electrician is familiar, comes within the 25 per cent drop range. Systems having lamps are usually limited to a 10 per cent drop.

TABLE 1—AUDIBLE SIGNAL DATA

Type of Signal	Amperes				Watts			
	12 Volts AC	24 Volts AC	12 Volts DC	24 Volts DC	12 Volts AC	24 Volts AC	12 Volts DC	24 Volts DC
Small Buzzers.....	0.5	0.15	0.5	0.3	6.0	3.6	3.5	3.5
Large Buzzers.....	0.3	0.15	0.5	0.10	6.0	3.6	4.0	4.0
Small Bells 2½"-4" (Special Wound)...	0.6	0.2	0.6	0.15	6.0	6.0	3.5	3.5
Large Bells 2½"-4" (Standard Wound)	0.4	0.2	0.5	0.10	5.0	5.0	3.5	3.5
Large Bells 6"-8".....	1.0	0.25	0.35	0.11	8.0	8.0	4.5	4.5
Large Bells 10"-12".....	1.0	0.25	0.40	0.12	10.0	10.0	5.0	5.0
Polarized Bells 3"-4".....	0.35	0.15	.....	.....	4.0	4.0	.....	.....
Polarized Bells 6"-8".....	0.35	0.15	.....	.....	5.5	5.5	.....	.....
Polarized Bells 10"-12".....	0.5	0.33	.....	.....	6.0	8.0	.....	.....
Small Buzzers Solenoid Type.....	1.2	0.5	.....	.....	18	12	.....	.....
Small Bells, Single Stroke.....	1.5	0.8	.....	.....	20	20	.....	.....
Large Bells, Single Stroke 4".....	1.0	1.0	0.5	0.5	24	24	12	12
Large Bells, Single Stroke 6"-8".....	1.0	1.0	0.5	0.5	24	24	12	12
Large Bells, Single Stroke 10"-12"...	1.0	1.0	0.65	0.65	24	24	16	16
Vibrating Horns.....	1.6	0.8	1.7	0.7	16	22	20	20
Small Chimes.....	1.0	1.0	0.5	0.5	15	15	12	12
Large Chimes.....	1.3	1.3	0.5	0.5	23	23	12	12

Factors to be Weighed

In laying out a low-tension signal circuit there are many factors to be considered, embracing the location, type and number of signal devices. Audible signals, for example, should be placed at centrally located points where the sound will be evenly distributed over a given area. If lamps are used, they should be seen from as many directions as is possible. Multiple or parallel circuits of bells, buzzers and horns must use only apparatus, which is designed for that purpose and be high resistance wound. This is especially important where there are unusually long runs. Small systems, of only two or three bells, operate satisfactorily in multiple.

While some low-tension systems have apparatus connected in series, it is almost entirely limited to fire alarm and small call systems. Such apparatus must be of the non-contact type in order to give satisfactory service. The audible signals coming within this category are single-stroke, polarized, floating-on-line type bells; polarized, reed and diaphragm type buzzers; non-contact type horns. Either contact or non-contact

Wiring Design

By: Albert A. Schuhler

*Chief Sales Engineer
Stanley & Patterson, New York*

type bells may be connected in multiple.

For commercial purposes, standard resistances are chosen for the windings of apparatus, and under average conditions it results in satisfactory operation, both from economy and efficiency standpoints. For institutional use, however, where many devices operate together, high resistance apparatus should be used. While the volume of sound is somewhat decreased under this arrangement, the bells are fairly close together, and therefore, are not as loud as in commercial work.

In this article, therefore, it is only necessary to consider those systems operating on 12 and 24 volts, since these are used most frequently in signaling installations. True, some commercial installations are operated on 6 to 9 volts, but these are usually small, as far as the length of the circuits are concerned, and carry only a few devices.

Requirement Tables

On this basis, the accompanying tables have been made up for convenience in calculating sizes of wires for signal systems. They have been compiled from information provided by several signal manufacturers, from experience and from tests. They are calculated to take care of maximum requirements, to carry all possible types of audible signal devices. While in some cases these requirements, for wire sizes, may seem rather high, never the less, these sizes are recommended because they will deliver the proper voltage at the terminals of all devices. For more accurate results on more extensive systems, however, it is suggested that the manufacturers of such apparatus be consulted.

Table 1 presents audible signal data for a number of units. Since there is quite a variation in the specifications

(Continued on page 86)

TABLE 2—SIZE WIRE ON 12 VOLT SYSTEM

Length of Circuit (One-way Distances)	Load in Amperes									
	0.5 Amp.	1 Amp.	2 Amp.	3 Amp.	4 Amp.	5 Amp.	6 Amp.	7 Amp.	8 Amp.	10 Amp.
25 ft.....	18	18	18	18	16	16	16	16	16	16
50 ft.....	18	18	18	18	16	16	16	16	14	14
75 ft.....	18	18	18	18	16	14	14	14	12	12
100 ft.....	18	18	18	16	14	14	12	12	12	10
150 ft.....	18	18	16	14	12	12	12	10	10	8
200 ft.....	18	18	14	12	12	10	10	10	8	8
300 ft.....	18	16	12	12	10	8	8	8	6	6
400 ft.....	18	14	12	10	8	8	6	6	6	5
500 ft.....	16	14	10	8	8	6	6	6	5	4
600 ft.....	16	12	10	8	6	6	6	5	4	3
700 ft.....	16	12	10	8	6	6	5	4	4	3
800 ft.....	14	12	8	6	6	5	4	4	3	2
900 ft.....	14	12	8	6	6	5	4	3	3	2
1000 ft.....	14	10	8	6	5	4	3	3	2	1

TABLE 3—SIZE WIRE ON 24 VOLT SYSTEM

Length of Circuit (One-way Distances)	Load in Amperes									
	0.5 Amp.	1 Amp.	2 Amp.	3 Amp.	4 Amp.	5 Amp.	6 Amp.	7 Amp.	8 Amp.	10 Amp.
25 ft.....	18	18	18	18	18	18	18	18	18	18
50 ft.....	18	18	18	18	18	18	18	18	18	16
75 ft.....	18	18	18	18	18	18	18	16	16	14
100 ft.....	18	18	18	18	18	16	16	16	14	14
150 ft.....	18	18	18	18	16	14	14	14	14	12
200 ft.....	18	18	18	16	14	14	12	12	12	10
300 ft.....	18	18	16	14	12	12	12	10	10	8
400 ft.....	18	18	14	12	12	10	10	10	8	8
500 ft.....	18	16	14	12	10	10	8	8	8	6
600 ft.....	18	16	12	12	10	8	8	8	6	6
700 ft.....	18	16	12	10	10	8	8	6	6	6
800 ft.....	18	14	12	10	8	8	6	6	6	5
900 ft.....	18	14	12	10	8	8	6	6	6	5
1000 ft.....	16	14	10	8	8	6	6	6	5	4

Enlarged service shop layout
makes superintendent's office
handy to customers
but keeps them out of the shop.

Shop Privacy

SHOP production is easily interrupted by curious customers and by-standers. But in a remodeling program, recently completed by the H. N. Crowder Jr. Company of Allentown, Pa., a plan was worked out to end this nuisance. The customer has ready access to Superintendent C. R. Durand's modern office, but has no occasion to wander around the plant. Also, with this arrangement, the workmen can consult the boss without annoyance to the waiting customer. It was all done by a little careful planning of passageways, partitions and doors.

Today this shop's business is transacted independent of the company's general offices, in a modern and cheerful atmosphere, well isolated from the noises, smells and unavoidable dirt of the adjoining shop. Job details can be

discussed here quietly with a customer, while an employee may also get in an important report without being at all in the way. When it is good business to tour the shop, the customer is taken through by someone who knows how.

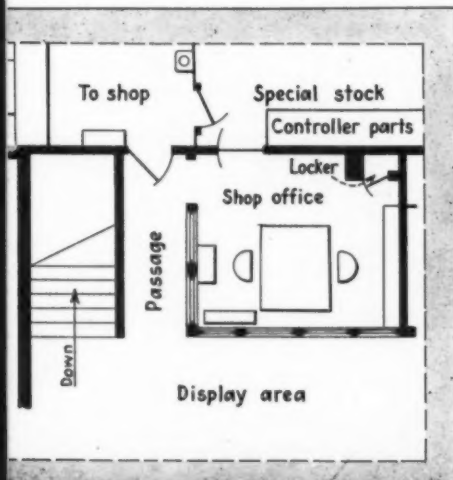
Industrial customers are generally interested in new devices and apparatus. So this company makes them run the gauntlet of its equipment display floor, after leaving the telephone operator-information desk at the main entrance. Arriving at the shop superintendent's office, near the rear of the display floor, a clerical assistant has already been forewarned that a customer is shopward bound. If the boss is not immediately available, there is a choice of waiting in the shop office or of accepting a polite suggestion to look around at what is new. The clerk promises to

call the customer in when Superintendent Durand is available. This polite handling takes the curse off the "No Admittance" letters on the shop door.

During the course of a conversation, if a customer wishes to see a certain bearing or other repair part, it is not necessary for Mr. Durand to walk away from his desk to get it. The more valuable and intricate items of this type are available from the stockroom that adjoins the superintendent's office, to which there is a door. This material may be brought into the office by the stock clerk without opening the doors leading to the shop area.

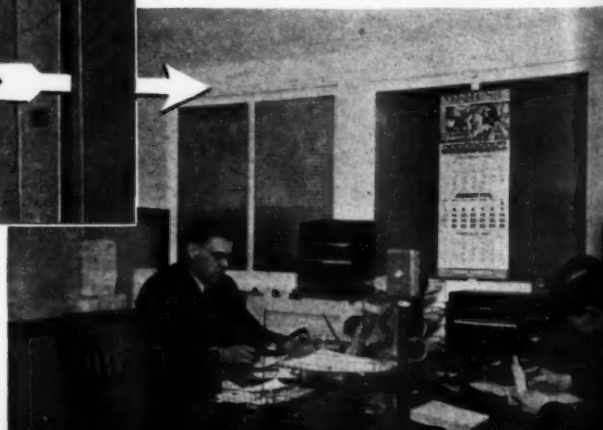
Here then is a shop office that retains the dignity of a private office. But it is so located that it maintains close contact with the customer and also retains its control over shop production routine.

Customer Convenience—This layout of the superintendent's office, also provides quick access to special parts stockroom or to the shop. But several walls isolate the office from noise, dirt and fumes.



Shop Office is separate from the general offices, and beside the shop. Note near door one of several speakers used for paging and signal service.

Shop Customers meet Superintendent C. R. Durand (below) in this private office. When he is out, an assistant serves as pinch hitter.



Equipment Displays located in front of the shop office, keep waiting customers interested. The shop clerk suggests that they look around if Superintendent Durand is not immediately available. Part of the company's 25th anniversary crowd of invited guests is shown.



20 MILLION HOMES UNDEREQUIPPED ELECTRICALLY

10 MILLION HOMES STILL UNWIRED

2 MILLION HOMES YET TO BE BUILT

Who's going to satisfy this demand?

20 million homes need new electrical equipment. 10 million homes haven't any at all. 2 million homes yet to be built will have to be supplied. The biggest market of all time for household electrical equipment lies just ahead! Who's going to supply this demand? The merchandiser who knows what kind of equipment sells in a rising market . . . and who offers that to his prospects . . . quality equipment, dependable equipment. When it comes to Meter and Service Entrance Equipment, be sure that you feature Cutler-Hammer . . . it's a better investment for the user, a better sale for the contractor,

a better installation for the power company.
CUTLER-HAMMER, Inc., Pioneer Manufacturers of
Electric Control Apparatus, 1306 St. Paul Avenue,
Milwaukee, Wisconsin.

CUTLER-HAMMER
SERVICE EQUIPMENT

is

**BETTER SERVICE
EQUIPMENT**

BETTER FOR THE POWER COMPANY
BETTER FOR THE CONTRACTOR
BETTER FOR THE USER

The non-interchangeable main and range switch pull-outs illustrated at the left are one of the many features of the Cutler-Hammer Range Switch (Cat. No. 4334H15). They illustrate as well the care exercised by C-H to meet the practical needs of the field.

SAFECOTE

ELECTRICAL CONDUCTORS

ARE BUILT AND TESTED BY US

TO RIGID SAFECOTE STANDARDS

American Steel & Wire Co.
 American Wire and Cable Co.
 The M. B. Austin Company
 Bishop Wire and Cable Corporation
 Clifton Conduit Company
 Collier Insulated Wire Company
 Crescent Insulated Wire Co.
 General Cable Corporation
 General Electric Company
 H. J. Harshaw Cable Works Corp.
 Hazard Insulated Wire Works
 DIV. OKONTA CO.
 National Electric Products Corp.
 Paramite Wire & Cable
 Providence Insulated Wire
 John A. Roebeling's Sons
 Simplicity Wire & Cable
 Triangle Conduit
 United States Products, Inc.

The almost universal demand for Safecote electrical conductors is an eloquent testimonial of your confidence in this product and its trade-mark. This well deserved confidence is a responsibility that increases as the demand for Safecote in-

creases. You look for perfect ability and resistance. You look to the Safecote trade-mark as the guarantee of these qualities. You look to Safecote because no

There is no substitute for

Confidence

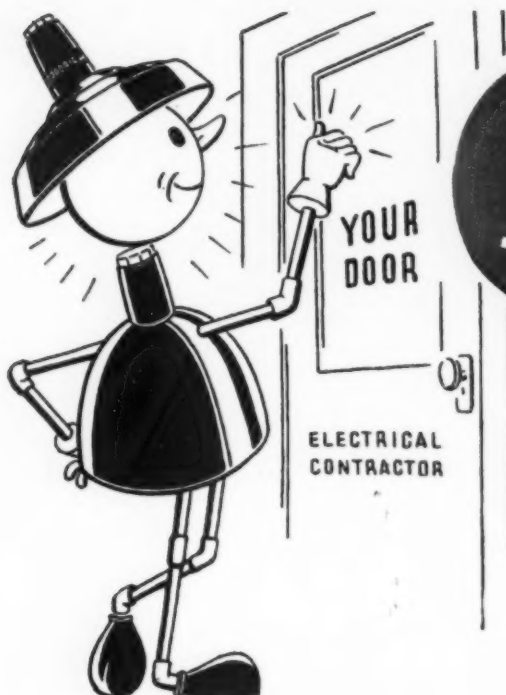
ELECTRICAL

Safecote for maximum fish-
resistance to moisture and flame. You
Safecote mark as your guaran-
tee of quality. You insist upon
and no substitute for Safecote.



SAFECOTE LABORATORIES ARE AT YOUR DISPOSAL
SAFECOTE PERFORMANCE SPECIFICATIONS UPON REQUEST

GEORGE C. RICHARDS, LICENSOR'S AGENT
155 EAST 44TH STREET, NEW YORK CITY



**"OPPORTUNITY
IS KNOCKING"**

—Says

SUNNY LUMENS

the Goodrich Man

● "Smart electrical contractors are building business with the Goodrich Stocklite. Why? Because it's the only reflector ever really *designed* to provide proper illumination for narrow aisle stock rooms. Demonstrate it to any stock room manager and your job's sold. Ask your wholesaler about it."

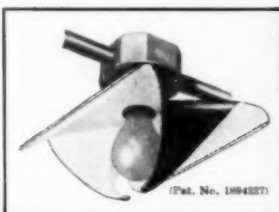
THE GOODRICH STOCKLITE

for better stock bin illumination

● No longer a need for gloomy stock bins—or spotty lighting in the aisles—or squinting stock clerks trying to identify numbers, labels, typewritten slips, etc. The Stocklite delivers a high intensity of light, properly diffused from top to bottom shelf and on shelf surfaces. It eliminates glare—speeds up handling.

How this odd-shaped Reflector does the trick

Note how the Stocklite directs light to the side—how the curved V-shaped flange eliminates aisle glare—how it uses the lamp's full efficiency. It's a "natural" to sell—another exclusive Goodrich product. If your wholesaler doesn't have it, ask him to write us immediately.



Note the uniformly high illumination on the shelves in this typical installation. Note also the absence of glare.

GOODRICH

ELECTRIC COMPANY

OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES & FACTORY, 2902 NORTH OAKLEY AVENUE, CHICAGO, ILLINOIS

INSTRUMENTS

SYSTEM SURVEYS for FACT FINDING

What Instrument Tests Accomplish

Only by regular inspection and tests can electrical systems be kept at high efficiency
...What to look for...What to do



HANDY ANALYZER—Voltmeter, ammeter, watt meter and power factor meter are combined in this Weston industrial analyzer.

Electrical measuring instruments provide the one reliable tool for finding out what is taking place in the electrical system. For each dollar expended for current it is only reasonable to expect useful performance from motors, lights and other apparatus. Yet there are various reasons why electrical systems as a whole perform below par.

Surveys based on instrument tests point out the drones. From such surveys it is possible to reduce current waste, to increase production efficiencies, to solve the causes of costly interruptions, and to locate the weak or inefficient spots in the system.

Instruments are available for this service in industries, institutions, commercial establishments, and in the home as well. No loss is too small to be ignored. For example, a saving of one kilowatt at 2c. per kilowatt-hour means \$48 per year, assuming 300 work days of 8 hours each. Furthermore, a 10 kw. saving amounts to \$480 a year.

Reasons for Making Surveys

Every electrical system, to be kept at maximum operating efficiency requires periodic tests. The major points to be checked are:

1. Voltages delivered to lamps, motors and other current using devices.
2. Electrical losses occurring in distributing systems.
3. Correctness of motor and control application; and mechanical power transmission equipment.

4. Effects of load changes upon power factor.
5. Standards of illumination.

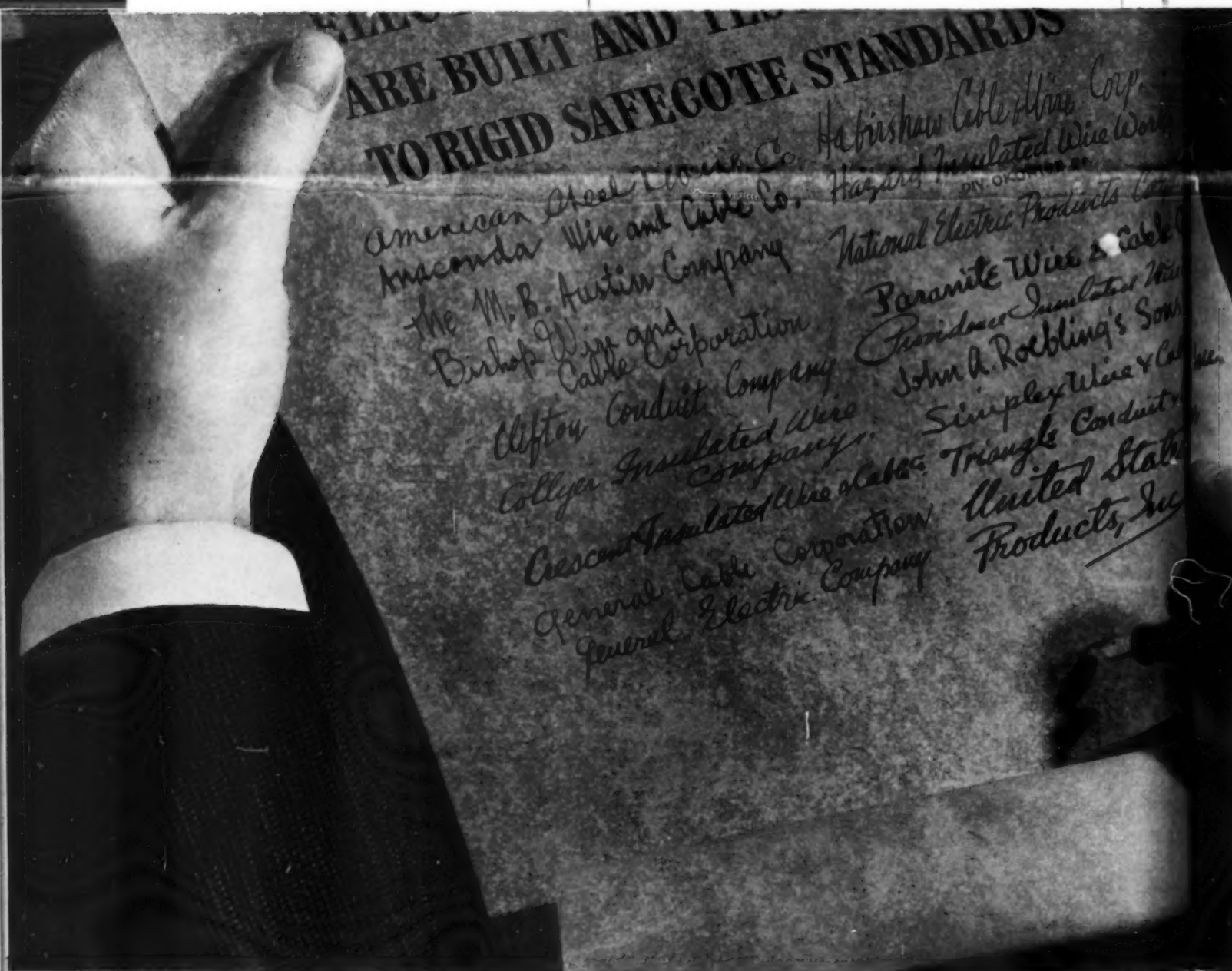
Effect of Changes

Because plant operating conditions and processes are changed from time to time, there are few electrical systems which continue to provide for the most efficient use of power. Motors are changed, new machines are added, or departments are re-arranged, often causing serious overloads upon the wiring system. The effect of such unforeseen alterations upon the working voltage, upon motor starting characteristics, upon lighting efficiencies, and upon the conductor insulation is often serious.

Motor changes or altered loads, for example, effect the power bill. A 20 hp. induction motor, delivering only 10 hp., operates at about 85 per cent efficiency; whereas a 10 hp. motor would pull this load at about 88 per cent efficiency. At 2c. per kilowatt-hour, the 10 hp. motor would save \$14.40 in the power bill each 300-day year, besides improving the power factor. Moreover, the investment required in equipment would be less.

Electricity also is wasted if conductors are overloaded and unduly heated. A No. 2 feeder carrying 100 amps. for eight hours, at a drop of seven volts, means a loss of 700 watts, or 5.6 kilowatt-hours per day. For 300 days this totals 1680 kwh., and at a 2c. rate, the loss would amount to \$33.60 for the year.

Announcement!



The almost universal demand for Safecote electrical conductors is an eloquent testimonial of your confidence in this product and its trade-mark. This well deserved confidence is a responsibility that increases as the demand for Safecote in-

creases. You look for safety, reliability and resistance to moisture. You look to the Safecote trade-mark as a guarantee of these Safecote qualities. You buy Safecote because it is the

When to Use Instruments and Where

There is no substitute for

Confidence

ELECTRICAL



U. S. LETTERS PATENT NUMBERS:
1,635,829 1,772,436 1,765,000
1,798,486 1,410,790 1,536,549

OTHER PATENTS PENDING

**INSIST UPON GENUINE SAFECOTE
FOR YOUR PROTECTION**

look for Safecote for maximum fish-
resistance to moisture and flame. You
insist on the Safecote trade-mark as your guaran-
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the Safecote name as no substitute for Safecote.

SAFECOTE LABORATORIES ARE AT YOUR DISPOSAL
SAFECOTE PERFORMANCE SPECIFICATIONS UPON REQUEST
GEORGE C. RICHARDS, LICENSOR'S AGENT
155 EAST 44TH STREET, NEW YORK CITY



**"OPPORTUNITY
IS KNOCKING"**

—Says

SUNNY LUMENS

the Goodrich Man

● "Smart electrical contractors are building business with the Goodrich Stocklite. Why? Because it's the only reflector ever really *designed* to provide proper illumination for narrow aisle stock rooms. Demonstrate it to any stock room manager and your job's sold. Ask your wholesaler about it."

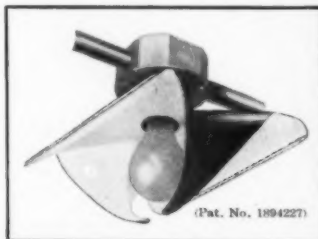
THE GOODRICH STOCKLITE

for better stock bin illumination

● No longer a need for gloomy stock bins—or spotty lighting in the aisles—or squinting stock clerks trying to identify numbers, labels, typewritten slips, etc. The Stocklite delivers a high intensity of light, properly diffused from top to bottom shelf and on shelf surfaces. It eliminates glare—speeds up handling.

How this odd-shaped Reflector does the trick

Note how the Stocklite directs light to the side—how the curved V-shaped flange eliminates aisle glare—how it uses the lamp's full efficiency. It's a "natural" to sell—another exclusive Goodrich product. If your wholesaler doesn't have it, ask him to write us immediately.



Note the uniformly high illumination on the shelves in this typical installation. Note also the absence of glare.

GOODRICH

ELECTRIC COMPANY

OFFICES IN ALL PRINCIPAL CITIES

GENERAL OFFICES & FACTORY, 2902 NORTH OAKLEY AVENUE, CHICAGO, ILLINOIS

INSTRUMENTS

SYSTEM SURVEYS for FACT FINDING

What Instrument Tests Accomplish

Only by regular inspection and tests can electrical systems be kept at high efficiency
...What to look for...What to do



HANDY ANALYZER—Voltmeter, ammeter, watt meter and power factor meter are combined in this Weston industrial analyzer.

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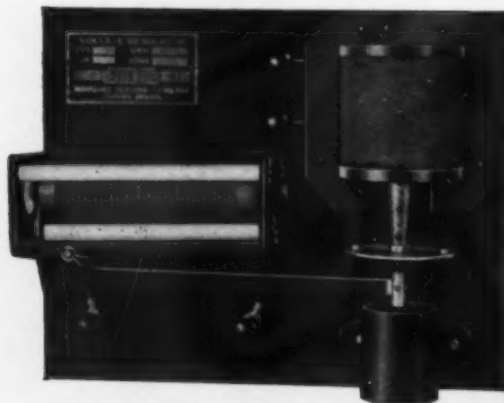
Announcement!



The Marshall Floating-Carbon-Pile Regulator is instant in action, accurate, positive, automatic—and low in first cost.

Advantages of Marshall Regulator:

1. Simple and rugged
2. No make and break contacts
3. Nothing to wear out
4. No maintenance
5. Simple to install—no experts required
6. No large leads to run to connect up
7. Sensitive
8. Fully automatic
9. Exclusive patents
10. Small watt consumption
11. Air dash pot—no oil—helps maintain correct mechanical and electrical balance on the operating lever.
12. Dash pot operation not affected by temperature



Showing simplicity of construction of the Marshall Floating-Carbon-Pile Regulator—no delicate parts to get out of order, no electrical contacts to cause trouble.

IDEAL Scores Again

ENCOURAGED by the growing demand for "IDEAL" products, we have added many new items to our line in the last few years.

Continuing this policy of expansion, we now announce the purchase of the patents of the Marshall Electric Company of Elkhart, Indiana, which operated the largest plant in the world devoted exclusively to the manufacture of Regulators for the control of voltage, current and speed.

The Ideal Commutator Dresser Company will continue the manufacture and development of this well-known line under the Marshall patents exclusively, which cover many major improvements in automatic regulation.

These fine products will now have the backing of our engineering, research, development and manufacturing facilities, as well as the advantage of our widespread sales and service organization.

Your inquiries for Regulators, for generators with capacity up to 400 K.W. direct current, and 1500 K.V.A. alternating current, will have our prompt attention—and your orders will be backed by the same guarantee of satisfaction which has built up the great demand for our other products.

IDEAL

IDEAL COMMUTATOR DRESSER CO.

1041 Park Ave. Sycamore, Illinois



The Marshall Electric Plant—the only one in the world devoted exclusively to the manufacture of Regulators for voltage, current and speed control.

When to Use Instruments and Where

How to organize orderly surveys of distributing system, load, power factor and lighting to avoid trouble in industrial and commercial systems.

IN any electrical system there are four principal divisions in which survey operations may be classified. First, the distributing or wiring system; second, the loads or power consumption of various equipment; third, the power factor of the system; and fourth, the lighting system.

Electrical systems should be tested as soon as they are placed in normal service. Thus a record will be acquired of the actual load, as compared with the calculated load for which the system was designed or installed. Then periodic tests should be made at intervals of at least once each year thereafter. Accurate records are thus available which show the expansion of load, peak hours, condition of insulation, available spare circuits and feeder capacity, etc. Intermediate tests should be made whenever a sizeable load is added to any part of the system.

Distributing System Surveys

If trouble occurs in any part of the system, special tests should be made without delay to find the cause, in order to properly correct it. Common troubles are the improper or too frequent functioning of over-current devices; heating of feeders, panelboards or transformers; sluggish starting of motors; or complaints of dim lamps. Regular tests can be planned to be conducted in conjunction with and as a part of the system maintenance routine.

Tests are made upon distributing systems to determine their ability to safely carry the load; to ascertain the physical and electrical condition of transformers, distribution centers, feeders, and circuits; to measure the voltage drop; to determine the condition of insulation; and to check up on the grounding system, to prevent shock or fire.

A properly designed distributing system will transmit electricity from the transformers or main switchboard to all current consuming devices with a small decrease or drop in voltage under full load conditions. This drop in

voltage means wasted power in the conductors, especially when the amperage is high.

Power in watts, being the product of voltage and amperes, any increase in the operating voltage will reduce the current. The watts lost in the useless heating of conductors is equal to the square of the current multiplied by the resistance of the circuit ($W = I^2R$). From this it will be seen how a saving is made by avoiding low voltage.

Insulation Surveys

Insulation resistance values are checked to avoid sudden feeder breakdowns because of unknown insulation deterioration or injury. Conductors may have become subjected to excessive moisture or heat, to acids or fumes, severe abrasion or other injuries. Only regular tests will reveal these hidden weak spots in the network of conductors.

For old insulation a resistance value of 1,000 ohms-per-volt-rating of the conductor insulation is considered to be the minimum, while some authorities advise a minimum value of 1,000,000 ohms (1 megohm). For old 600-volt insulation a value of from 600,000 ohms to 1 megohm is thus considered the lowest safe value. For new installations, these values should be proportionately higher.

Load Surveys

Motors are tested to see that they are kept loaded at their most efficient point. This may be important not only from the standpoint of running load, but also as to starting characteristics, adaptability of speed to expensive machinery, reversing operations, severe duty cycles and other functions.

By means of load curves from periodic motor tests, it is possible to check up on defects or gradual wearing out of expensive drives or machines. Likewise operators of machines can be

checked to prevent the abuse of machinery. Tests may also reveal economies to be derived through combining machines on one drive, where their maximum duty cycles seldom occur at the same time.

Power Factor Surveys

Low power factor burdens transformers and feeder circuits with heat-producing current, that performs no actual work. Low power factor conditions are chiefly due to improperly loaded induction motors, but other causes are welding equipment, some types of transformers for mercury vapor lamps, and gaseous tube lighting equipment. Tests must be made in order to determine the actual percentage of lagging current or power factor.

The benefits that are derived from the correction of harmful power factor conditions are realized through relieving the system of this useless current flow in transformers and other

CHECKING LOAD—At a factory distributing panel, with a Westinghouse Industrial Analyzer, checking up on system balance.



major units of the system. In addition, some power companies grant a lower power rate for a highly corrected power factor. Other companies have no lower rate, but instead impose a penalty charge upon customers, who permit their power factor to fall below a fixed percentage level.

A complete survey should be made throughout the system. Some of the information for such a survey will already be available, where there is a complete test record of all motors in operation. In general a 90 per cent power factor is satisfactory. If the percentage is lower, then the places to

install corrective units, and the types and sizes required, can only be determined by carefully conducted power factor surveys.

Lighting System Surveys

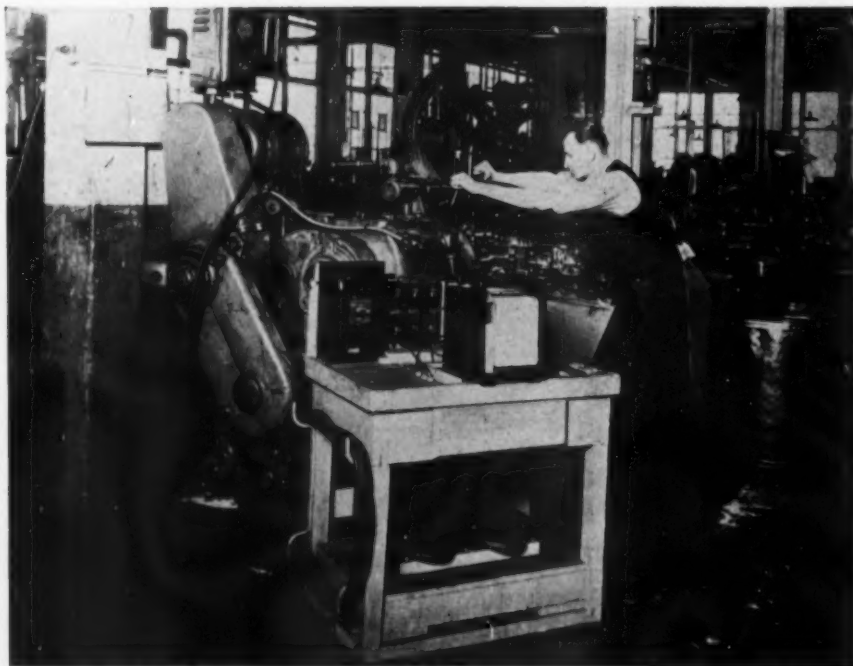
Regardless of the fact that the lighting system is equipped with the proper fixtures and bulb sizes, illumination depends upon the correct voltage being maintained at each lamp socket. Low voltage decreases illumination and high voltage reduces the life of lamps. If, upon test, correct voltage is found at lighted lamps, all is well. Otherwise a voltage survey should be made

at branch circuits, panelboards, and other points back to the main service entrance, until the difficulty is found.

By means of a "Sight-Light Meter" it is possible to determine whether or not every part of a lighting system is operated efficiently. Tables of correct illumination are available from lamp manufacturers, that indicate the amount of light required for almost every kind of work in the factory, store, office or institution. In addition to foot-candle-value tests, the proper application of lighting equipment, the avoidance of glare, and other variable factors, must also be determined.

How to Make System Surveys

The technique of checking up on wiring and apparatus — Instruments to use.



TEST TABLE—This Esterline-Angus portable test table provides connections for all kinds of instruments needed in testing about a plant.

TO determine the load or power consumed by any electrical equipment, it is necessary to connect the proper measuring instruments into its supply circuit. The type of instrument depends on the character of the circuit. A table showing the instruments required for different circuits and their connections for obtaining the loads or inputs of any electrical device is presented on a following page.

To obtain the actual hp. output of a motor, one must know its efficiency at the particular load when the measurements are made. To determine the efficiency of a motor, the electrical input must be measured and compared with its mechanical output. This comparison then indicates how much power is lost in the motor itself.

The duration of a test depends upon the duty cycle of the apparatus and

its friction or lowest load. Motors operating under a steady load require a very short test, as only one reading is necessary. With intermittent loads sufficient time must be allowed to obtain an average reading. It is important that the apparatus under test be operating at its normal temperature so that normal performance can be analyzed.

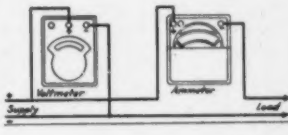
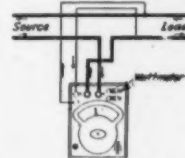
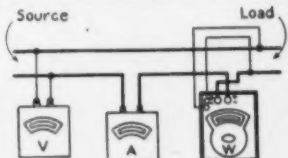
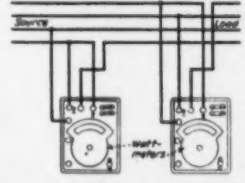
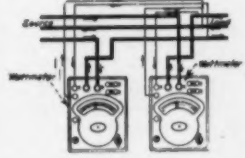
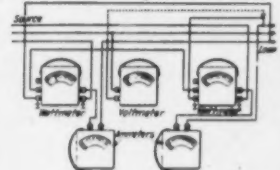
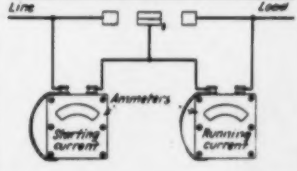
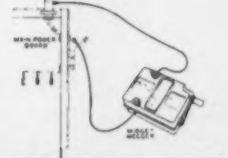
How to Make Voltage Surveys

A voltage survey becomes necessary to determine the cause where a decrease in voltage takes place. It is the difference in voltage between two points on the same conductor that forms the basis of a voltage survey. The greatest difference in this voltage will occur when the current or load has attained its maximum value and when the equipment is operating at its highest temperature.

Electrical apparatus and machinery is designed by the manufacturer for operation on some definite voltage. If the equipment is to function properly, this voltage must be maintained within reasonable limits. A voltage variation of more than ten per cent from normal is very undesirable. For example, in motors, if it is below normal rating, it will cause excessive heating and a great reduction in its efficiency.

Either one of two methods may be used for making voltage surveys. The first method employs two voltmeters, with ranges sufficient to measure the highest operating voltage of the system. One voltmeter is connected to

PUTTING INSTRUMENTS TO WORK

Test Objective	Circuit To Be Measured	Instruments To Use	Diagram of Connections
Direct Current Loads	Two Wire Direct Current	Ammeter Voltmeter	
Single Phase Loads	Two Wire Single Phase	Ammeter Wattmeter or Analyzer	
Single Phase Power Factor	Two Wire Single Phase	Ammeter Voltmeter Wattmeter or Power Factor Meter	
Polyphase Loads	Four Wire Two Phase	2 Single Phase Wattmeters or 1 Polyphase Wattmeter or Analyzer	
Polyphase Loads	Three Wire Three Phase	2 Single Phase Wattmeters or 1 Polyphase Wattmeter or Analyzer	
Polyphase Power Factor	Two or Three Phase Three Wire	As above plus 2 Ammeters and 1 Voltmeter or Analyzer (for Three Phase only)	
Motor Starting and Running Currents	Any Motor Circuit	2 Ammeters 1 for Starting Current 1 for Running Current or Analyzer	
Insulation Resistance	Any Circuit	Megohmmeter	



8" Channeluminum, with flat bar transformer connections, used by Minnesota Mining and Manufacturing Co., St. Paul, Minnesota. Installed by Commonwealth Electric Company, Minneapolis, Minn.

● The main run of Bus Bar, top center in the illustration, is a well engineered application of Channeluminum. It is used for the main feeder because the rolled channel sections are shaped for the greatest practical electrical and thermal efficiency. It partially supports the flat bar branches leading off right and left, because it is mechanically strong. Placing it overhead, out of the way, is easy because it is light.

Channeluminum has the maximum combination of electrical efficiency and mechanical strength, in addition to standard advantages of Alcoa

Aluminum Bus. Channels are easily joined by bolting or welding. Resistance to corrosion, a natural property of Aluminum, assures continuous operation of properly installed runs exposed to corrosive fumes and gases.

The advantages you get from Alcoa Aluminum Bus Bar are inherent in the metal itself. You can depend on service reliability that checks with expected economies. May we send you complete data? ALUMINUM COMPANY OF AMERICA, 2197 Gulf Building, Pittsburgh, Pennsylvania.



ALCOA · ALUMINUM

the terminals of the apparatus under test and the second is connected to the same circuit at branch circuit junctions and, where possible, to the switchboard or source of supply. This determines the drop between these points.

Since this method requires simultaneous readings, some communicating system, such as a portable telephone, must be devised so that the person in control of the test may record the voltage at each meter at the same time. Both meters must be calibrated to read alike and any discrepancy between them must be known corrected.

Graphic meters also may be used for recording the variations in voltage at several different points. Their

calibration and timing, of course, must be accurate, or results will not check.

Where Voltage Fluctuates

By the second method, voltage tests may be made with a single low-reading voltmeter, having long leads, that will reach between the various points, at which measurements must be made. This method is best where the voltage fluctuates, because only one instrument is read. As a matter of precaution the voltmeter should have a double scale and the maximum scale must have sufficient range to measure the operating voltage of the system.

In taking the first reading, the volt-

meter connection should be made to the high-range scale. Therefore, if the meter is accidentally connected across conductors of different polarity, no injury will result. In these measurements, each conductor must be properly identified before making a test. The load must be at its maximum and the current in the conductor known, if the loss is to be determined in watts. Conductors should also be at their normal working temperatures.

When using a single voltmeter, it is very often found that the voltage drop in each of the conductors, in the same circuit, will be different, owing to a difference in resistance of the individual conductors.

Selecting Instruments for the Job

What equipment should the contractor or plant electrician have on hand for use in surveys— General requirements — Specific suggestions

IN order to make system surveys, portable instruments are needed, either the indicating or graphic type, depending upon the scope of the tests to be made. The higher grade instruments are preferable because of their greater accuracy.

MOTOR PERFORMANCE—With the right equipment, the system can be kept in tune. These two men are using General Electric voltmeter and ammeter to check this operation.

The range and scale of instruments to be selected will be governed by the sizes of systems to be surveyed and their operating voltages. While it is possible to purchase instruments of several ranges, it is cheaper to have two or more instruments, and thus be able to conduct several tests at the same time.

General Requirements

For direct current tests, the usual instruments required are a multi-range voltmeter and an ammeter, provided with external shunts having several ranges. On alternating current systems, ammeters, voltmeters and wattmeters are essential, the latter instrument being especially valuable.

Where heavy currents are handled, it is necessary to use current transformers, and for voltages of over 750, the use of both current and potential transformers is necessary. In order that ordinary current overloads may be measured, ammeters and wattmeters should be selected which will give about two-thirds scale readings, when measuring normal maximum loads.

Several reliable instrument manufacturers have developed compact assemblies of indicating instruments to facilitate testing, by avoiding temporary interconnections on the job.

Voltmeters:

Voltmeters are easily selected, as any type can be supplied with a double range and thus provide for high, as well as low-voltage tests. Multipliers may also be used for increasing the range of a voltmeter.

Direct Current Ammeters:

The amount of current to be measured will in most cases determine the type of ammeter to use. The proper scales of instruments can be ascertained from the motor name plates or from a table showing the current required by d.c. motors.

For example, a 10 hp. d.c. motor, operating at 220 volts, requires 38 amps. at full load. For this motor, an ammeter should be selected, which has a scale reading 0 to 50. This same ammeter can also be used for smaller motors, provided the readings are not too low for the scale. It takes about 2 amps. per hp., on a 550-volt d.c. circuit, allowing for overloads.

Ammeters (millivoltmeters) for use with external shunts of several capacities are recommended for testing motors of all sizes.

Demand Meters:

Designed for separate readings of the power demand, for the purpose of con-

[Continued on page 37]



TIP FOR CONTRACTORS

Instrumentation

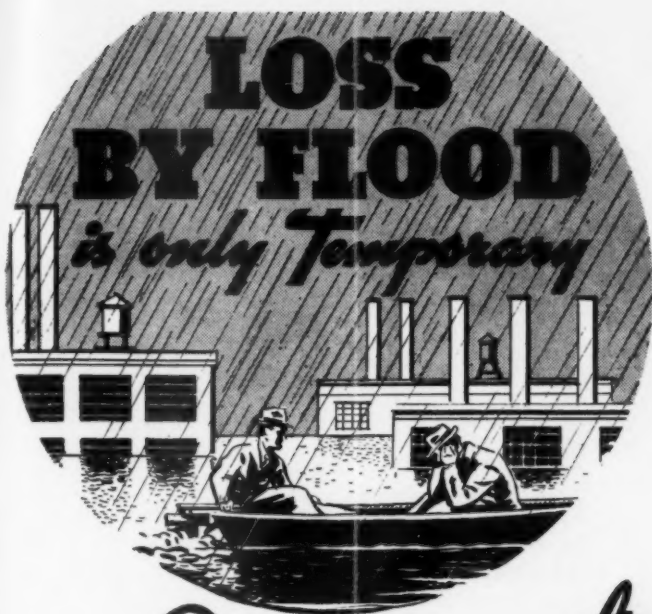
OPENS THE WAY FOR MORE MAINTENANCE CONTRACTS

"What you don't know won't hurt you," is a saying that has no place in Industry. It is Industry's business to know everything about the production of its goods. But without the help of electrical instruments, many losses that are now wasting profits will go undetected.

The contractor who, with instruments, can demonstrate the presence of profit leaks in a manufacturer's own operations... and the contractor who, again with instruments, can show ways of preventing these leaks is the contractor *retained* for a greater share of profitable maintenance work.

Instrumentize first your own operations and then capitalize to the fullest upon the instrumentation of your customers' production lines.

Your customer profits... and so will you. J 40079



Instruments detect Losses THAT MIGHT GO ON FOREVER

The losses suffered by industry in times of flood must be charged to the powerful and uncontrolled forces of nature. Unavoidable... the damage is only temporary... it is regretted, repaired and forgotten. Industry buckles down to work again.

But those unsuspected electrical losses that bore into profits like termites. They cannot be seen... they cannot be heard... they can only be detected by the use of electrical instruments. They might go on forever.

That motor drive which has grown such a familiar sight to you. Is it over-

loaded? Is it underloaded? Either way, it is a profit leak.

There is only one efficient and economical load for any electrical device, and that is its name-plate rating. And there is only one reliable means of determining load conditions... the consistent use of electrical instruments.

But even the intelligent use of electrical instruments is not enough unless the instruments have the quality that assures economy. Make sure your test data has the maintained accuracy assured by Westinghouse Portable Instruments.

J 40080

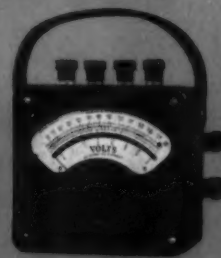
Westinghouse Portable Instruments assure the accuracy, durability, and ease of reading which have marked Westinghouse instrument manufacturing since 1888. Available in every standard size and rating, these instruments are reasonably priced. No logical reason exists for accepting lower quality.



Type U Recording Voltmeter.



Type PY-5 Double-Range Voltmeter.



Type PY-4 Five-Range Voltmeter.



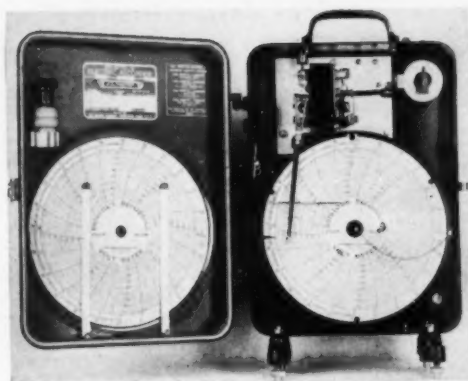
INDUSTRIAL ANALYZER—Self-contained for making complete a-c. tests up to 125 amperes, 600 volts on single, two, or three-phase circuits.

Westinghouse

PORTABLE INSTRUMENTS



RADIO-FREQUENCY MILLIAMMETERS • AMMETERS • MICROAMMETERS • MILLIAMMETERS
• AMMETERS • RECTOX MICRO- AND MILLIAMMETERS • MILLIVOLTMETERS • VOLTMETERS
VOLT AMMETERS • WATTMETERS • GALVANOMETERS



FOR INDICATING, RECORDING, INTEGRATING—Here are the three types of portable instruments useful in plant surveys. There are (left to right) Roller Smith indicating watt meter, Bristol graphic voltmeter and Sangamo watt hour meter.

Shunts:

Shunts are made in sizes from one to several thousand amps. It is well to select those with even ratios, such as 10-100-200, as the instrument scales are easier to read. For example, an 0-100 amp. millivoltmeter scale reads direct in amperes, when used with a 100-amp. shunt. With a 10-amp. shunt, its readings must be divided by 10. With a 200-amp. shunt, its readings are multiplied by 2.

Alternating Current Ammeters:

The selection of a.c. ammeters is governed by full load current values, and in addition, any heavy current in-rush, which occurs when motors are started. Again, tables are readily available which show the current required by motors and other equipment.

For example, the average 50-hp. a.c. motor operating at 220 volts, 3 phase, requires 124 amps. It takes about one ampere per hp. per phase on a 550-volt, 3-phase circuit.

It must be remembered, however, that these figures cover the full load currents of the motor and do not take into consideration the starting current or the overloads. To protect instruments, under these conditions, short-circuiting switches may be used, when ammeters are connected direct to the motor circuit. Motor starting currents may run as high as three or four times their full load current rating. When these values are to be measured, instruments having larger scales must be used.

When testing other apparatus, it is safe to provide for the normal loads determined from the name plate ratings. But in a.c. test work, where low power factor exists, some allowance should be made for the greater current to be measured.

Split core ammeters may be used to advantage, where great accuracy is not required. The principle advantage

of this instrument is the ease with which it may be used around heavy cables, at motors or distributing centers, without any disturbance to the equipment that is operating.

Single Phase Wattmeters:

These instruments are very accurate and may be obtained with two current and potential ranges, to adapt them to diversified testing work. They are also available with self-contained voltage coils, up to 750 volts.

Polyphase Wattmeters:

What has been said of single phase wattmeters is also true of polyphase wattmeters. They contain two single-phase elements, mechanically connected in one case. The polyphase wattmeter has one scale and for this reason is easier to read than two single phase instruments.

Potential Transformers:

Potential transformers are required for use with instruments, where the voltage is above 750. The secondary of all potential transformers is standardized at 110 volts.

Current Transformers:

Current transformers are required where the voltage is over 750, and for measuring currents greater than the capacities of ammeters and wattmeters. The secondary current of such transformers is 5 amps. at its rated capacity in the primary circuit. Therefore, ammeters and wattmeters, used with such transformers, should be provided with 5-amp. current windings.

Industrial Analyzer:

This is a combination of several instruments in one compact case, and is very convenient for survey purposes. Such sets are arranged for measuring

voltage, current, and watts, in single, two and three-phase circuits in limited capacities.

Megohmmeters:

This instrument is required for obtaining direct measurements of the insulation resistance of distributing systems and insulated electrical apparatus. It is available in several types and ranges.

Power Factor Meters:

Periodic power factor surveys can be made quickly with these specialized instruments.



INSULATION LOSSES—Working with a Biddle Megger, feeling around for losses in the distribution network.

Small indicating instruments, which show the foot candles of illumination

Occasional need may well develop, for the use of a frequency meter, especially for isolated plants, a tachometer, where exact speeds of rotating machinery is to be determined and a groundmeter for checking permanent grounds.



GADGETS FOR TESTS—(1) Connector for 100 amp. cutout, (2) a 60 amp. fuse with interior removed, (3) with leads connected and (4) one taped for use on 600 volts.

A few suggestions of handy gear to connect up instruments

terior entirely removed through the end caps. Drill holes in the ends and insert an 8-32 screw, with three nuts to make terminals for connecting flexible cords, that serve as instrument leads. One nut is inside.

With these accessories, as shown in the pictures, instruments can be placed in circuit quickly, by pulling out the good fuse from the cutout with one hand, and with the other hand, immediately inserting any of these temporary connections. The motor or other apparatus will hardly be disturbed.

In cases where tests are to be repeated at intervals it is recommended that some permanent means be provided for inserting instruments temporarily into the circuit. The first cost would be quickly absorbed in the time saved and convenience.

A simple method of compiling data from plant surveys for easy comparison

DATA obtained by instruments on any system must be accurately recorded, easy to compare and analyze, if they are to have any value. This information should be kept on file available for reference, when changes in equipment or system design are contemplated.

The following form suggests a con-

venient arrangement. Naturally, the most useful record is that which most completely reflects the conditions in the individual plant. In many cases, it is desirable for the record to also include a form for recording maintenance operations, so that test and maintenance history will be combined for ready reference.

[illegible]

TEST REPORT—*Tests should be carefully recorded and the record should be complete and easy to compare. These headings make a very useful report form.*

What to Buy and Who Makes It

An Index of the Principal Instruments Used in Electrical System Surveys, and the Manufacturers Who Sell Them

Ammeters and Voltmeters

GENERAL ELECTRIC CO. *Schenectady, N. Y.*
HICKOCK ELECTRICAL INSTRUMENT CO. *Cleveland, Ohio*
LUNDQUIST TOOL & MFG. CO. *Worcester, Mass.*
NORTON ELECTRICAL INSTRUMENT CO. *Manchester, Conn.*



Norton voltmeter

RAWSON ELECTRICAL INSTRUMENT CO. *Cambridge, Mass.*
ROLLER-SMITH CO. *Bethlehem, Pa.*
WESTINGHOUSE ELECTRIC & MFG. CO. *East Pittsburgh, Pa.*
WESTON ELECTRICAL INSTRUMENT CORP. *Newark, N. J.*

Instrument Shunts

ESTERLINE-ANGUS CO. *Indianapolis, Ind.*
GENERAL ELECTRIC CO. *Schenectady, N. Y.*



Weston instrument shunts

HICKOK ELECTRICAL INSTRUMENT CO. *Cleveland, Ohio*
NORTON ELECTRICAL INSTRUMENT CO. *Manchester, Conn.*

ROLLER-SMITH CO. *Bethlehem, Pa.*
WESTINGHOUSE ELECTRIC & MFG. CO. *East Pittsburgh, Pa.*
WESTON ELECTRICAL INSTRUMENT CORP. *Newark, N. J.*

Split Core Ammeters

FERRANTI ELECTRIC, INC. *30 Rockefeller Plaza, New York City, N. Y.*



Columbia tong test meter

COLUMBIA ELECTRIC MANUFACTURING CO. *Cleveland, Ohio*

Wattmeters

GENERAL ELECTRIC CO. *Schenectady, N. Y.*
HICKOCK ELECTRICAL INSTRUMENT CO. *Cleveland, Ohio*
NORTON ELECTRICAL INSTRUMENT CO. *Manchester, Conn.*

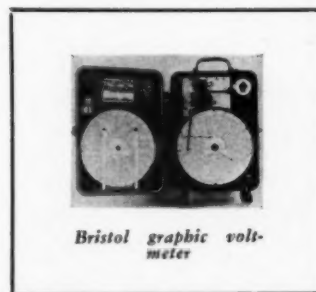


Roller-Smith Watt meter

ROLLER-SMITH CO. *Bethlehem, Pa.*
WESTINGHOUSE ELECTRIC & MFG. CO. *East Pittsburgh, Pa.*
WESTON ELECTRICAL INSTRUMENT CORP. *Newark, N. J.*

Graphic Meters—(Ammeters, Voltmeters, Wattmeters)

BRISTOL CO. *Waterbury, Conn.*
ESTERLINE-ANGUS CO. *Indianapolis, Ind.*



Bristol graphic voltmeter

GENERAL ELECTRIC CO. *Schenectady, N. Y.*
WESTINGHOUSE ELECTRIC & MFG. CO. *East Pittsburgh, Pa.*

Instrument Transformers—Potential and Current

ESTERLINE-ANGUS CO. *Indianapolis, Ind.*
GENERAL ELECTRIC CO. *Schenectady, N. Y.*
HICKOK ELECTRICAL INSTRUMENT CO. *Cleveland, Ohio*



General Electric current transformer

TRY IT AT

NEW CLIP-ON AMMETER

... by Ferranti

OUR EXPENSE



WHAT IT DOES

This instrument instantly and accurately indicates the current flowing in a bare or insulated conductor—merely clip the frame around the conductor. With this instrument the balance can immediately be determined in 3-wire systems or 3-phase circuits. Loads on feeders, switches, motors, transformers, can be accurately checked. Multitudes of other readings can be readily taken.

You owe it to yourself to accept our offer to send you at our expense one of the New Ferranti Dual Range Clip-On Ammeters! We make this offer because we know that once you've used it, you will be convinced that it will save you time and money.

Try it for two weeks! You'll find it safe and accurate in measuring current in A.C. conductors and bus bars. You'll like its convenient single-hand operation, leaving the other hand absolutely free. By means of the dual range feature a simple turn of the self-contained switch immediately changes the range of the instrument.

FREE 2 WEEKS OFFER

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We accept your offer of a 2-WEEK'S FREE TRIAL of the Ferranti Clip-On Ammeter, with the understanding that there are no "strings" tied to this offer. We'll give it a fair trial and judge it on results.

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Company

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Milli-voltmeters	Relays

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For A.C. and D.C. Circuits

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METERS**

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Street Address.....

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Manchester, Conn.
ROLLER-SMITH CO.
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Newark, N. J.

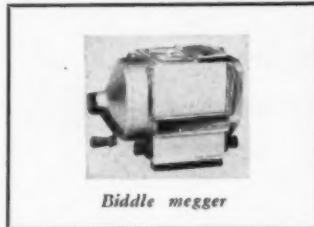
Ohm S Megohmmeters

A. Insulation Testing. B. Resistance Measuring.

ESTERLINE-ANGUS CO. (B)
Indianapolis, Ind.

JAMES G. BIDDLE CO. (A B)
1211-13 Arch St., Philadelphia, Pa.

LEEDS & NORTHRUP CO. (B)
4918 Stenton Ave., Philadelphia, Pa.



Biddle megger

ROLLER-SMITH CO. (B)
Bethlehem, Pa.

H. H. STICHT & CO. (A B)
27 Park Place, New York City

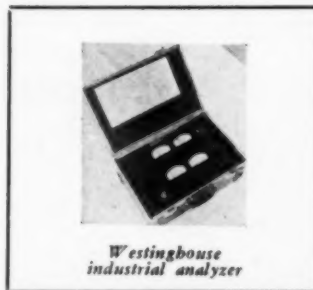
WESTINGHOUSE ELECTRIC & MFG. CO. (B)
East Pittsburgh, Pa.

WESTON ELECTRICAL INSTRUMENT CORP. (B)
Newark, N. J.

Industrial Analyzers

HICKOK ELECTRICAL INSTRUMENT CO.
Cleveland, Ohio

NIAGARA ELECTRICAL INSTRUMENT CO.
Buffalo, N. Y.



Westinghouse
industrial analyzer

WESTINGHOUSE ELECTRIC & MFG. CO.
East Pittsburgh, Pa.

WESTON ELECTRICAL INSTRUMENT CORP.
Newark, N. J.

Power Factor Meters

ESTERLINE-ANGUS CO.
Indianapolis, Ind.



Weston power factor
meter

GENERAL ELECTRIC CO.
Schenectady, N. Y.
ROLLER-SMITH CO.
Bethlehem, Pa.
WESTINGHOUSE ELECTRIC & MFG. CO.
East Pittsburgh, Pa.
WESTON ELECTRICAL INSTRUMENT CORP.
Newark, N. J.

Demand Meters

DUNCAN ELECTRIC CO.
Lafayette, Ind.

GENERAL ELECTRIC CO.
Schenectady, N. Y.



Lincoln demand meter

LINCOLN METER CO.
Springfield, Ill.

SANGAMO ELECTRIC CO.
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WESTINGHOUSE ELECTRIC & MFG. CO.
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Watt-Hour Meters

(Integrating)

DUNCAN ELECTRIC CO.
Lafayette, Ind.

GENERAL ELECTRIC CO.
Schenectady, N. Y.



Sangamo watt-hour
meter

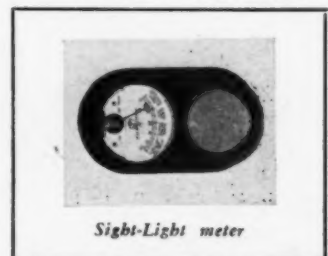
SANGAMO ELECTRIC CO.
Springfield, Ill.

WESTINGHOUSE ELECTRIC & MFG. CO.
East Pittsburgh, Pa.

Sight Meters

GENERAL ELECTRIC CO.
Schenectady, N. Y.

SIGHT LIGHT CORP.
342 Madison Ave., New York City



Sight-Light meter

WESTINGHOUSE ELECTRIC & MFG. CO.
East Pittsburgh, Pa.
WESTON ELECTRICAL INSTRUMENT CORP.
Newark, N. J.

Frequency Meters

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1211-13 Arch St., Philadelphia, Pa.
ESTERLINE-ANGUS CO.
Indianapolis, Ind.
GENERAL ELECTRIC CO.
Schenectady, N. Y.



Leeds & Northrup
frequency meter

LEEDS & NORTHRUP CO.
4918 Stenton Ave., Philadelphia, Pa.
ROLLER-SMITH CO.
Bethlehem, Pa.
WESTON ELECTRICAL INSTRUMENT CORP.
Newark, N. J.

Tachometers

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BRISTOL COMPANY
Waterbury, Conn.
BROWN INSTRUMENT CO.
Wayne & Windrim Ave., Philadelphia, Pa.
ELECTRIC TACHOMETER CO.
Broad & Spring Garden Sts., Philadelphia, Pa.



Brown Tachometer

ESTERLINE-ANGUS CO.
Indianapolis, Ind.
GENERAL ELECTRIC CO.
Schenectady, N. Y.
H. H. STICHT & CO.
27 Park Place, New York City
WESTINGHOUSE ELECTRIC & MFG. CO.
East Pittsburgh, Pa.
WESTON ELECTRICAL INSTRUMENT CORP.
Newark, N. J.

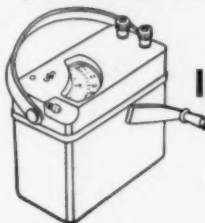
Ground Resistance Meters

JAMES G. BIDDLE CO.
1211-13 Arch St., Philadelphia, Pa.
THE BORDEN ELECTRIC CO.
Summit, N. J.
H. H. STICHT & CO.
27 Park Place, New York City



Borden groundometer

This instrument section tells
you HOW TO DO IT... and



STICHT
INSTRUMENTS

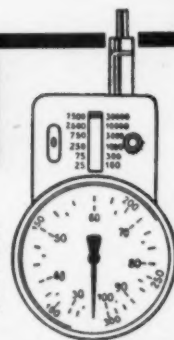
help you
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Dwarf Megohmer

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A hand-type, direct-reading instrument adjustable to rotary speeds of 25 to 30,000 R. P. M. A necessity for every industrial electrician and contractor, or for repair shop service.



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Please send me (check one or both)

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LONG
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TAKE TO MEASURE
THESE CURRENTS?



You could read them all accurately in less than 5 minutes if you had a Tong Test... and without breaking the circuit. Tong Tests measure A.C. or D.C., they are perfectly safe and are made with interchangeable meter dials for readings of 0 to 800 amperes. They are precision-made and dependable but also low in price.

Would you like to receive a copy of the Tong Test bulletin? No obligation, of course.

Columbia Electric Mfg. Co.
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TONG TEST AMMETERS

Practical helps on—

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By F. A. ANNETT and A. C. ROE

Revised, enlarged, up-to-date Second Edition

302 pages, 6 x 9, 224 illustrations, \$3.00

This book gives you two practical, dependable manuals in one, the first dealing with d.c. motor and generator windings and how to reconnect them for changes in speed, voltage, or both, and the second telling how to locate and remedy faults in these machines.

From this book you will get all necessary rules and principles, demonstrated in typical worked-out problems, for doing such jobs as:

- changing 220-volt wave wound shunt motor for 110-volt operation
- changing 125-volt 15-kw. compound-wound generator for 250-volt operation
- changing 110-volt compound-wound interpole motor for 550-volt operation
- changing 50-kw. 125-volt shunt-wound generator for 250-volt operation etc., etc.

Special chapters tell you how to convert a series motor into a shunt or vice versa, and how to figure a new winding for an old core when no data on original windings are available.

How to locate and remedy insulation failures, short circuits, open circuits, grounds, reversed coils, etc., how to test what the results mean, is made plain and workable.

This edition tells:

- how to purchase armature and field coils
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- how to increase rating by changing conductors and insulation
- how to bring out the leads from armature coils; how to insulate them
- how to test lap-wound armatures having equalizer connections
- how to make high-potential tests, etc., etc.

10 DAYS' EXAMINATION—Send This Coupon
McGraw-Hill Book Co., Inc., 330 W. 42d St., N.Y.C.
Send me Annett and Roe—Connecting and Testing
Direct-current Machines for 10 days' examination
on approval. In 10 days I will send \$3.00, plus
few cents postage, or return book postpaid. (Post-
age paid on orders accompanied by remittance.)

Name

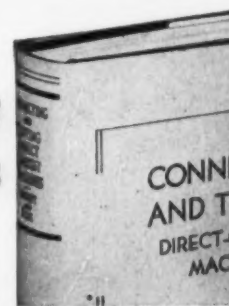
Address

City and State

Position

Company

(Books sent on approval in U. S. and Canada only)





WHAT TO BUY—AND WHY

THE easiest way for you to determine exactly what to buy—and why—is to get in touch with your nearest G-E office. There are five different sizes (and price ranges) of G-E portable indicating instruments; several types of G-E instruments for switchboards and small panels; recorders, both portable and switchboard; laboratory standards, potentiometers, galvanometers, and a host of other useful devices. The coupon is for your convenience.

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Headquarters for Electrical Measurement

Please send me information on portable indicating instruments ☐

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GENERAL ELECTRIC

NOW!

Turn the page and
read about

Anaconda's "Modernize Wiring" Campaign

We present a concise and workable plan to follow in making surveys of plant wiring conditions. This plan should enable you to cash in on the information you've gathered from the preceding pages.



Anaconda Wire & Cable Company

GENERAL OFFICES • 25 BROADWAY, NEW YORK
CHICAGO OFFICE • 20 NORTH WACKER DRIVE

Are you getting Anaconda's Wiring

WE OFFER you here a Wiring Survey for use in developing industrial business. This Survey contains detailed instructions on how to diagnose electric circuits in the industrial plant. It was prepared for the express purpose of helping you and your men benefit directly from Anaconda's "Modernize Wiring" advertising campaign.

Estimates show that 9 out of 10 factories suffer serious losses due to antiquated wiring. The Anaconda campaign presents this fact to manufacturers. It urges a "Wiring Survey" in order that losses be uncovered and stopped.

This campaign is sound economics. It tells the factory how to save money. It promotes the efficient use of electricity. In this way it offers the way to profitable wiring contracts for you.

Write for your copy of this "Survey". It gives you the "door opener" you've been wanting.

Use the coupon—if more convenient than a letter.

*I'm developing
good prospects
from Anaconda
advertising*

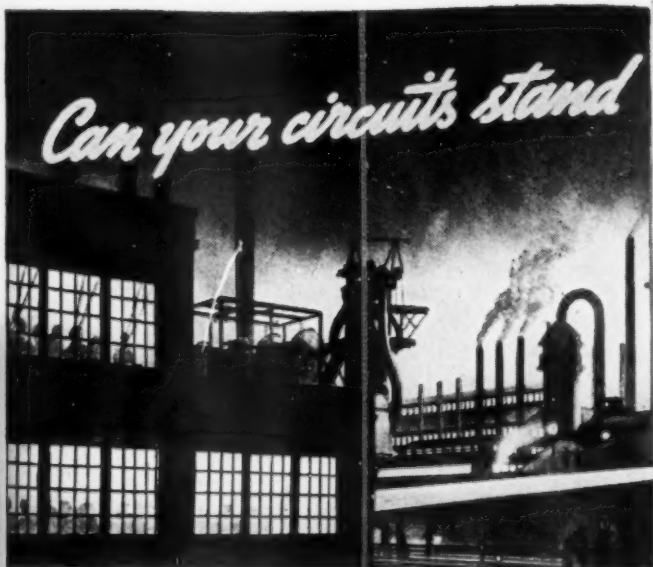


37547

Anaconda Wire & Cable

General Offices: 25 BROADWAY, NEW YORK • Chicago Office: 20 NORTH WACKER DRIVE

business with Survey?



High-speed production may cause expensive breakdowns. Avoid them! This free Wiring Survey shows you how to check electric circuits.

EVERY DAY, neglected circuits collect their toll from American industry. A feeder "blows". The result is a tie-up. Products "freeze" in process. Deliveries are delayed. Often, thousands of dollars are lost before wheels start turning again. Estimates show that 9 out of 10 plants today are handicapped by antiquated, deficient electric wiring.

Even when actual breakdowns do not occur, the extra burden that is being put upon worn-out circuits leads to *irretrievable* dollar waste. Power is dissipated in the form of heat. Voltage drop causes machines to slow down. Maintenance and

repair bills are higher than they should be.

Take a few moments now to safeguard your factory against these dangers. Have a check-up of electric circuits made. A check-up will cost you nothing. This free Wiring Survey shows how to make it. Your electrical engineer, your industrial consultant, or your electrical contractor, can direct a survey.

Write for complimentary copy of this booklet. If you have a specific problem in mind, please consult with our Engineering Department. We will cooperate without obligation.



Anaconda Wire & Cable

General Offices: 25 Broadway, New York

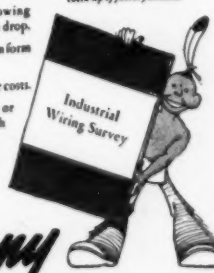
Chicago Office: 20 North Wacker Drive



Modernized wiring aids plant operation in these 6 ways

- 1 Prevents breakdowns that retard production and cause labor to lose wages.
- 2 Prevents light losses and slowing down of machines due to voltage drop.
- 3 Prevents dissipation of power in form of heat losses.
- 4 Lowers maintenance and repair costs.
- 5 Permits shifting of equipment or installation of new machinery with minimum delay.
- 6 Protects safety of workers and lowers insurance rates.

This free Wiring Survey shows you how to make a check-up of factory circuits.



Company

Sales Offices in Principal Cities

Industrial
Wiring Survey

Ruth was not so much perspiring to get her to drop her books and put on a sunbath. I'd leave my horse hitched outside the cottage where she stayed with her aunt. Ruth was an orphan.

Once up in the hills, I could hardly contain myself. I wanted to crush her sweet young body close, kiss her with all the pent-up passion of my starving soul, but I held myself back. I spoke of what I longed to do for the mountain folk. She told me about the children she taught. Everything she said made me love her more.

Once I nearly lost control. She looked at me. "Precher Birch, I want to thank you for what you mean to me. You make everything clear. We hill folks couldn't get along without you."

My heart pounded furiously; I had to stifle my arms to keep them from clutching her. Her lovely, adoring eyes set me crazy with desire.

I wanted to shout out, "And I can't get along without you, Ruth. I need you, I love you." But all I did say was, "There are kind words, Miss Ruth. They make me real happy. But I don't want you to call me 'Precher Birch'. You and I are friends. Call me 'David'."

So we became David and Ruth to each other, though she was always rather shy and still treated me more as a father. She would bring me her little problems and I tried to straighten them out. One day she put both her hands in mine of her own free will. "You're so good, dear David," she said. It was more than flesh and blood could stand. I felt her soft breath on my chin. I clutched her in a tight embrace that left us both breathless. I pressed my hungry lips to hers in hard, demanding kisses. "I love you, Ruth. I want you to love me, work with me. I can't go on living without you."

Instantly I cursed my age. Was I taking advantage of a trusting child? Something in my passionate love must have awakened a response. I seemed to feel a fire in her soft lips and I was delicious with joy. She drew back and I looked down into her flushed face. "When will you marry me, Ruth?" I asked.

She was very serious. "David, I shouldn't have allowed you to kiss me that way. I'm proud that you love me. It's a great honor. I—I respect you, David. You're the first man I've ever known; any woman should be proud to help you. But—but—"

"What is it, Ruth?" I said sternly. "Not another man?" I was stunned by the quick rush of jealousy. "You must have known how I felt, Ruth."

"David, I'm not in love with any one else, at least, I don't know that I am. Oh, how does one know?" she finished wilyly.

"Probably just some boy-and-girl attachment. Not a deep true love, the kind I have for you and believe you have, or will have for me."

"Oh, I don't know. You are so wise, David—"

"Then, let me decide for you, meet this man—"

It turned out there was a boy of twenty-one courting Ruth. He'd come to Victory Ford the summer before and got a job in Gilbert's store.

"A decent lad and a willing worker," Gilbert told me when I inquired. "He's up Forest Hill just now. I sent him to pick up a load of wood."

"I'm always interested in getting to know the young folk," I said.

"Yeah, we all know the good work you're

69

Reproduced here is an advertisement in Anaconda's "Modernize Wiring" campaign. This and other announcements in this series appear in important national magazines reaching the business executive.

ANACONDA WIRE & CABLE COMPANY
25 Broadway, New York City

We would like a copy of your "Wiring Survey" together with other information about your "Modernize Wiring" program.

Signed.....

Street.....

City..... State.....

Company

SALES OFFICES IN PRINCIPAL CITIES

Methods of other CONTRACTORS

WIRING HUNG ON CABLE

With 150-watt RLM reflectors to mount on 10-ft. centers throughout the 54,000 sq.ft. area of an underwear factory, the Crowder Construction Corporation of Allentown, Pa., used lines of messenger cable for suspending pre-assembled outlet boxes, and runs of electrical metallic tubing. Each lengthwise row of outlets was erected in perfect alignment, because exact spacings were first determined for the lines of $\frac{1}{8}$ -in. messenger cable that were installed 10 ft. apart. After these cables were made taut with turnbuckles, they were strapped to the bottom chords of roof trusses.

Sectional runs of branch circuit tubing were then made up on the floor. These sections were hung to the messenger cable, complete with three and four outlet boxes and circuit wires. Common two-hole tin pipe straps and stove bolts were used on the backs of

the outlet boxes as saddle-hangers for the messenger cables. A sharp blow was made with a hammer upon each side of the tin straps to form them around the cable. The weight of the flexible cord and reflector kept all outlets hanging in a plumb position.

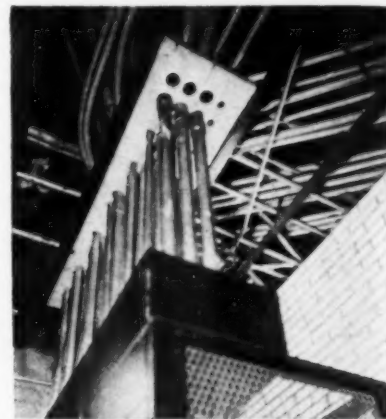
SPACING RANDOM OVERHEAD CONDUITS

Some 50-odd runs of feeder conduit had to be terminated above their respective circuits on a main switchboard, by the Carlson Electric Company of Youngstown, Ohio. They worked out the pipe spacings and wound up with an orderly installation at the top of the board. This was possible by terminating above the board in a large temporary template. The conduits were roughed in before the switchboard arrived.

The first problem encountered was to bring the various conduits to this board

from all corners of a large building by working them through the struts of fabricated steel joists. The adjoining rooms and corridors all have plastered ceilings, therefore exposed racks were not permitted. Also there was not sufficient fill on the floor above to accommodate these conduits.

Because of the closely spaced ceiling joists, there was no space to insert a large ceiling junction box for terminating the various runs horizontally. Therefore, after each run had been so routed as to align its elbow plumb with its future switchboard knockout, the nipping-down process was simplified. As a result, when the switchboard was erected on the job, all conduits were already in place ready for the



ORDERLY TERMINATION—Ceiling template above board keeps conduits in place before switchboard is erected.

final connecting nipples. With circuits all properly located above the board, the various feeder conductors could be laced together and formed downward along the panel edges without making crossovers behind the switchboard.

RACKING FROM WOOD JOISTS

Exposed conduits are being installed near the ceilings of crowded basement corridors in St. Vincent's Hospital at Erie, Pa. They are handled in a manner that gives good appearance, eliminates tedious off-sets, yet provides substantial support from wood ceiling joists that are concealed above the plaster line.

The various runs were ganged upon trapeze hangers made of 20-in. bars of 1-in. by 2-in. channel iron, suspended from the ceiling with $\frac{1}{2}$ -in. threaded hanger rods. Hangers were spotted about 10 ft. apart directly beneath the edges of floor joists. Each rod is supported from a $\frac{1}{2}$ -in. by 3-in. long coupling type lagscrew. The lagscrews, which employ round threaded couplings instead of the conventional forged bolt head, were screwed into the



CABLE SUSPENDED—Many outlets installed in floor-assembled groups upon messenger cable supports. Three and four outlets occurring between trusses were supported without long ceiling hangers.

ARE YOU A PRACTICAL MAN?

PRACTICAL MEN INSTINCTIVELY
RECOGNIZE THAT SIMPLICITY
SPELLS DEPENDABILITY

A protective device—a fuse—must be simple and rugged to be practical . . . Men who are responsible for keeping factories going,—for preventing production delays,—practical men,—have for more than 40 years depended on Union Fuses.

Why?—because they are practical, simple in design—rugged—easy and fast to renew—and give fuse protection at lowest yearly cost.—Practical electrical and industrial men specify and use Jefferson-Union Renewable Fuses.

**JEFFERSON
UNION**
Renewable
FUSES

**JEFFERSON
ELECTRIC COMPANY**
BELLWOOD (Suburb of Chicago) ILLINOIS
Canadian Factory: 535 Colborne Street, Toronto

BURNDY CONNECTORS

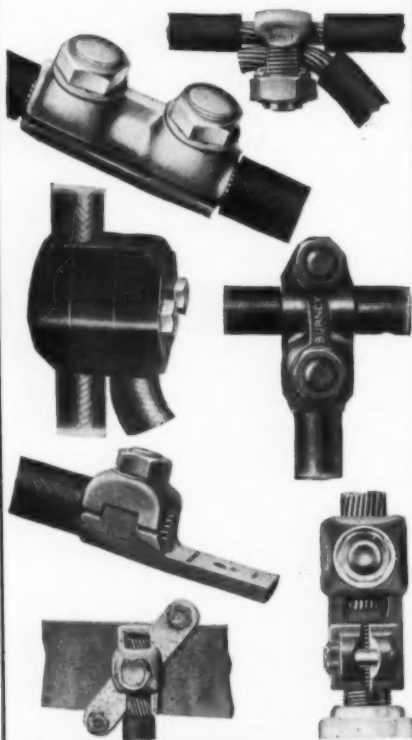
AN ANSWER TO THE PROBLEM OF SKILLED LABOR SHORTAGE . . .



VETERAN workmen are at a premium . . . and getting scarcer every day! No wonder profit-minded contractors are seeking the faster, easier way to make connections.

Most types of Burndy Solderless Connectors require only a wrench for installation. Others need only a screwdriver. An apprentice can install them faster than an experienced, well-paid workman can solder a joint!

Burndy Connectors are one way to help meet today's problem of skilled labor shortage . . . of rising labor costs. Ask your jobber for prices and details . . . or write us direct.



BURNDY

ENGINEERING CO. INC.

459 EAST 133d STREET, NEW YORK, N. Y.

Methods of other CONTRACTORS

[FROM PAGE 46]

overhead timber until the coupling shoulders or collars were flush against the plaster line. The hanger rods were then screwed into the lower end of the coupling to receive the trapeze bar.

The conduits illustrated are one 1½-in.,

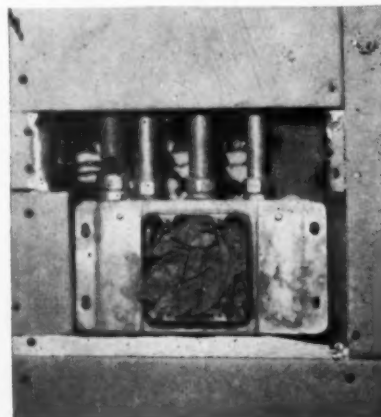


JOIST SUPPORTS—Lagscrews with hanger rod couplings make good trapeze hangers for good joist construction.

one 1-in., and three ¾-in. Several 1-in. runs were yet to be added to this rack, in wiring for a nurses call system, emergency lights and power, and a fire alarm system in this hospital. Installation by Northwest Construction Company of Erie.

WIRING SPACE FOR SMALL SWITCHES

Convenient switch controls for residences usually result in the unsightly ganging of four or more devices at one outlet box, in many places throughout the home. A typical example of solving such objections is this outlet in the



CONNECTION SPACE—Extra box width and special covers prevent overcrowded outlets when compact devices are grouped.

basement hall of a home that was recently wired by the Dengler Liddy Burd Electrical Co. of Elizabeth, N. J.

Here the use of compact wiring devices required only the space of a conventional two-gang plate to accommodate a group of six single-pole and three-way switches. To provide space for terminating two ¾-in. and two ½-in. runs of electrical metallic tubing, and to accommodate all the wires connecting to these switches, an 8½-in. wide flush outlet box was installed. The box cover was a three-piece assembly consisting of a two-gang device section in the center, to which blank filler ends were secured with screws for covering the normal four-gang box dimension.

The completed outlets and decorated surfaces in this home reveal only the compact plates and devices. Yet a considerable amount of concealed wiring is left accessible beyond the normal plate areas.

OUT-OF-HARM CONTROLLER MOUNTINGS

Control equipment is often of a type that can not take it in areas where severe mechanical abuse occurs. This



ABUSE PROTECTION—Foundry control equipment isolated from injury by mounting in the webs of heavy columns.

applies particularly to resistor banks for crane motors and other drives used in foundries.

The Terrell Electric Company, in wiring a large pipe foundry at Chattanooga, Tenn., chose the webs of H-columns as being a safe place to set up controllers. Measuring 24 in. by 14 in., these columns accommodated the grids nicely, while the controllers were bolted below them on strap iron that was fastened to the ½-in. thick flanges, after providing tapped holes in these heavy columns.

THE UNSEEN HAND



Curtis Lighting Ph

... that makes this installation
COMPLETELY AUTOMATIC

Selling Sangamo Time-Switches for the automatic control of lighting installations is often a stepping stone for additional equipment such as modern fixtures, accessories and wiring. But ... you must first acquaint the prospect with the fact that the unseen hand operates punctually, regularly and automatically.

Shown here is the pedestal floodlighting of a prominent Midwestern University.

• • •

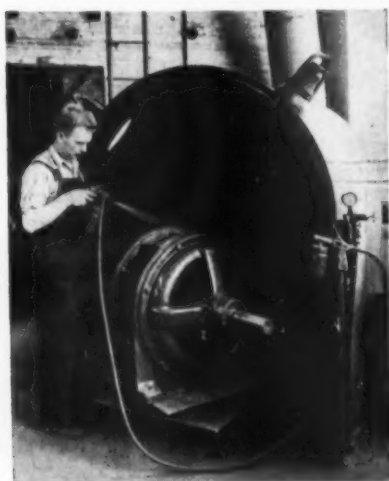
Opportunities to sell Sangamo Time-Switches are everywhere — that's why Sangamo Time-Switches are the best kind of "leaders".

SANGAMO ELECTRIC COMPANY **SPRINGFIELD ILLINOIS**

Among the MOTOR SHOPS

TURNTABLE FOR SPRAY BOOTH

Large motors are sprayed on all sides by revolving them within an approved spray booth in the shop of the Pacific Electric Motor Company, Oakland, Calif. It operates on a



UNDER COVER—Revolving stand makes spraying easy for all sides.

steel floor skid, equipped with an upper turret deckplate or turntable. One man is able to handle heavy equipment within the spray booth and is able to rotate it to always keep the spray gun directed toward the rear of the floodlighted booth, where an exhaust fan is located.

As a result, there is no annoyance or hazard from fumes escaping to the general shop area. Likewise, the motor rotating feature reduces the amount of floor space that would otherwise be required to spray large pieces of equipment.

A.C. MOTOR TEST VOLTAGES

Rewound stators are tested between phases and to ground with voltages that vary according to the size of motor,

by the U. S. Electric Engineering Company of Cleveland. For 220 and 440-volt motors, these tests are made—

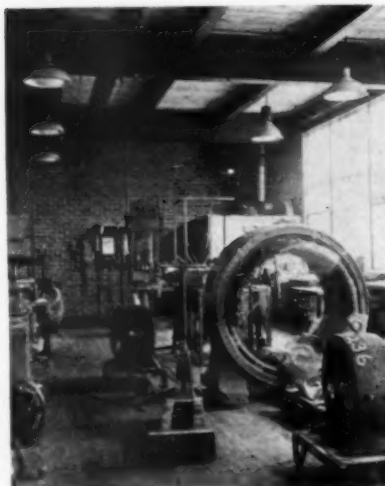
1. Up to 5 h.p., at 3,000 volts.
2. Above 5 h.p., and up to 25 h.p., at 4,000 volts.
3. Above 25 h.p. and up to 50 h.p., at 5,000 volts.

For 2,300-volt motors of all sizes, a test of 10,000 volts is applied.

GIVE SHOP FLOORS A BREAK

Although easy on the motor repair mechanic's feet, wood floors are severely abused, if heavy machines are skidded rough shod over them. The floors in a new motor shop, for the H. N. Crowder, Jr. Company of Allentown, Pa., are therefore protected two ways.

An overhead travelling electric hoist runs the full length of the shop. This takes care of "long haul" jobs, for example, from the baking oven to the



FLOORS SAVED—Combination of overhead hoist and handy floor skids reduces damage to new floors.

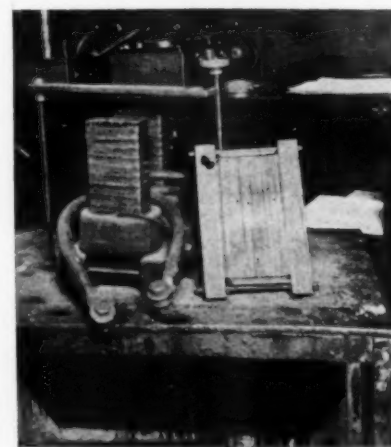
assembly and delivery docks at the opposite end of the shop.

For "local" traffic within a department, this company has a dozen or more rugged steel-frame floor skids

with oak tops, upon which motors may be scooted around with low-wheeled floor jacks. The floors are thus saved from being scratched up, and production goes on with little delay for want of quick transportation facilities.

TEST TRANSFORMER

A portable split-core transformer, comes in handy for making odd tests on such equipment as overload relays, interpole field coils and other general applications, where low voltage and high ampere values are necessary. It is built by the Electrical



FITS ANY JOB—With this test transformer proper ampere turns can be arranged to suit each test.

Installation Company of Cambridge, Mass. Using heavy cable for a single turn, this outfit has delivered 700 amp.

The upper member of the transformer core is independent of the other laminations. When in position, it is clamped upon the upright laminations by means of a knurled nut which regulates the tension on a flat steel cross-bar and tie bolts. Because of the ease with which this transformer can be opened to arrange the desired number of turns around either leg of its core, a wide variation of current values can be arranged with flexible conductors to provide for the desired testing burden.

TO KEEP BELTS TIGHT

Loose belts on lathes and other machinery bothered shop operations at the Fred Polster Electric Company of Cleveland. Pivoted-base drive attachments were worked out in its machine

After the Flood



Home and building owners and industrial plants are hastening to repair the terrible damage done to their electrical wiring systems and apparatus. The majority of the electrical contractors and repair shops who are doing the work want General Electric Friction and Rubber Tapes and other G-E Insulating Materials. They know, from past experience, the dependability of these materials.

If you have not used G-E Tapes or other insulating products, try them. You will find a complete, high-quality line to meet your every requirement. For complete information, see your G-E Merchandise Distributor or write Section M-883, Appliance and Merchandise Department, General Electric Company, Bridgeport, Conn.



GENERAL ELECTRIC INSULATING MATERIALS

APPLIANCE AND MERCHANDISE DEPT.

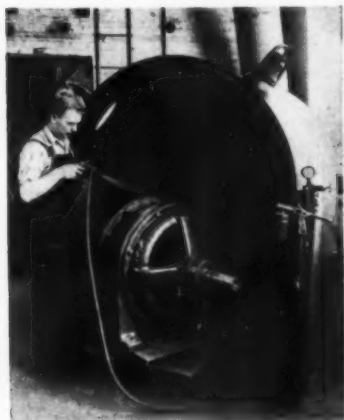
GENERAL ELECTRIC COMPANY

BRIDGEPORT, CONNECTICUT

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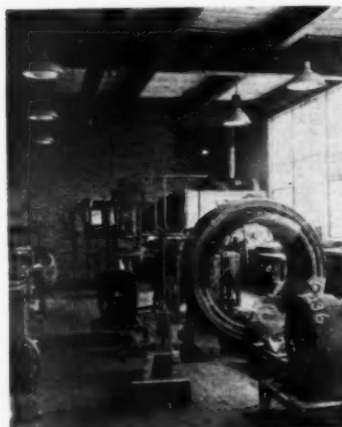
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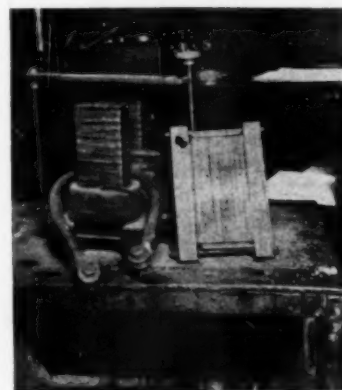
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Electrical Contracting, March 1937

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GENERAL ELECTRIC INSULATING MATERIALS

APPLIANCE AND MERCHANDISE DEPT.

GENERAL ELECTRIC COMPANY

BRIDGEPORT, CONNECTICUT

A Display Lighting Bargain that Gets the Business



Double lighting effectiveness with the same operating cost is a bargain that warms the heart of any merchant.

That's why Sterling FRONT-LINE LIGHTING is such an outstanding success — why so many alert merchandisers are replacing old style reflectors with Sterling Lite-Flo Reflectors.

No wonder contractors find that Sterling Lite-Flo Reflectors

help them get more business. Every Lite-Flo installation builds good will and paves the way to new contracts.

Get the complete story in this business building book. Just mail the coupon.



MAIL THIS COUPON

REFLECTOR & ILLUMINATING CO.
1435 W. Hubbard St., Chicago.

Send copy of brochure that tells about the marvelous improvement in display lighting afforded by Sterling Lite-Flo Reflectors.

Name

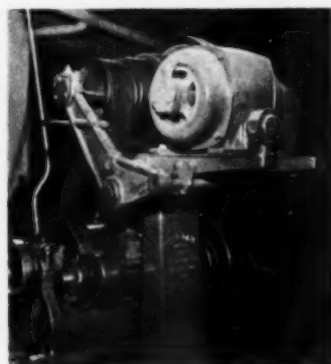
Address..... City..... State.....

Among the MOTOR SHOPS

[FROM PAGE 50]

shop to lick the trouble. Today each machine has an individual motor drive, mounted on this company's own make of device.

Other motor service shops and machinery dealers became interested in the Polster "Torq Drive," as it is called. So now they are being manufactured



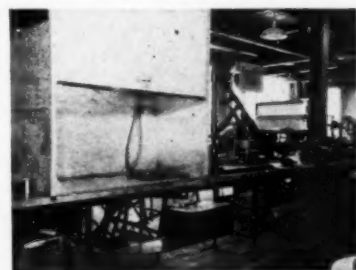
BELT TIGHTENER—Shop equipment works better since pivotted-base motor drives were installed.

and sold for use on machine tools and other types of equipment that need a short center motor drive. Flat belts and v-belts may be used with this equipment.

STREAMLINED MOTOR PRODUCTION

Repair operations for small motors follow in sequence right down this long bench. It is in the new H. N. Crowder, Jr. Company's service shop at Allentown, Pa.

Beginning at the front of the shop, this work proceeds toward the right, in this photograph. The motors are finally tested and ready for the spare



LINE PRODUCTION—Small motor repairs are begun at front of shop and follow along this bench to completion.

VARNISHED CAMBRIC • RUBBER POWER CABLES • BUILDING WIRE • RADIO

CRESCENT NON-METALLIC SHEATHED CABLE • SERVICE ENTRANCE CABLE • MAGNET WIRE • BARE WIRE

WIRE • RIGID CABLE • FLEXIBLE CABLE • LEAD-ENCASED AND PARAWAY CABLES • ARMORED CABLE

CRESCENT can meet *all* your wire and cable needs



Reproduction from actual photograph of our factory at Trenton, N. J.—Fifty years experience.

No matter what are the conditions to be met, no matter what industrial changes occur, the Research, Laboratory and Manufacturing facilities of CRESCENT make it possible for you to depend on this plant for your every requirement in

INSULATED WIRE *and* CABLE

CRESCENT
INSULATED WIRE & CABLE CO. INC.
 TRENTON, NEW JERSEY

Jobber Co-Operation — A Permanent Policy

CRESCENT EMDURITE SUPER-AGING INSULATION • WEATHER PROOF WIRE

"PANCAKE" WIREMOLD

UNLIMITED OPPORTUNITY to please old customers and



No. 1020
Telephone Outlet
A practical answer to the demand for safe and convenient wire connections in office buildings.

FOR TELEPHONE AND BUZZER WIRING

Pancake Wiremold meets the demand for a practical over-floor recessed wiring for buzzer and telephone extensions, desks and other equipment standing away from wall. Pancake Wiremold may be connected to 200, 500, 700 and 1100 Wiremold. It may also be connected directly to floor boxes.

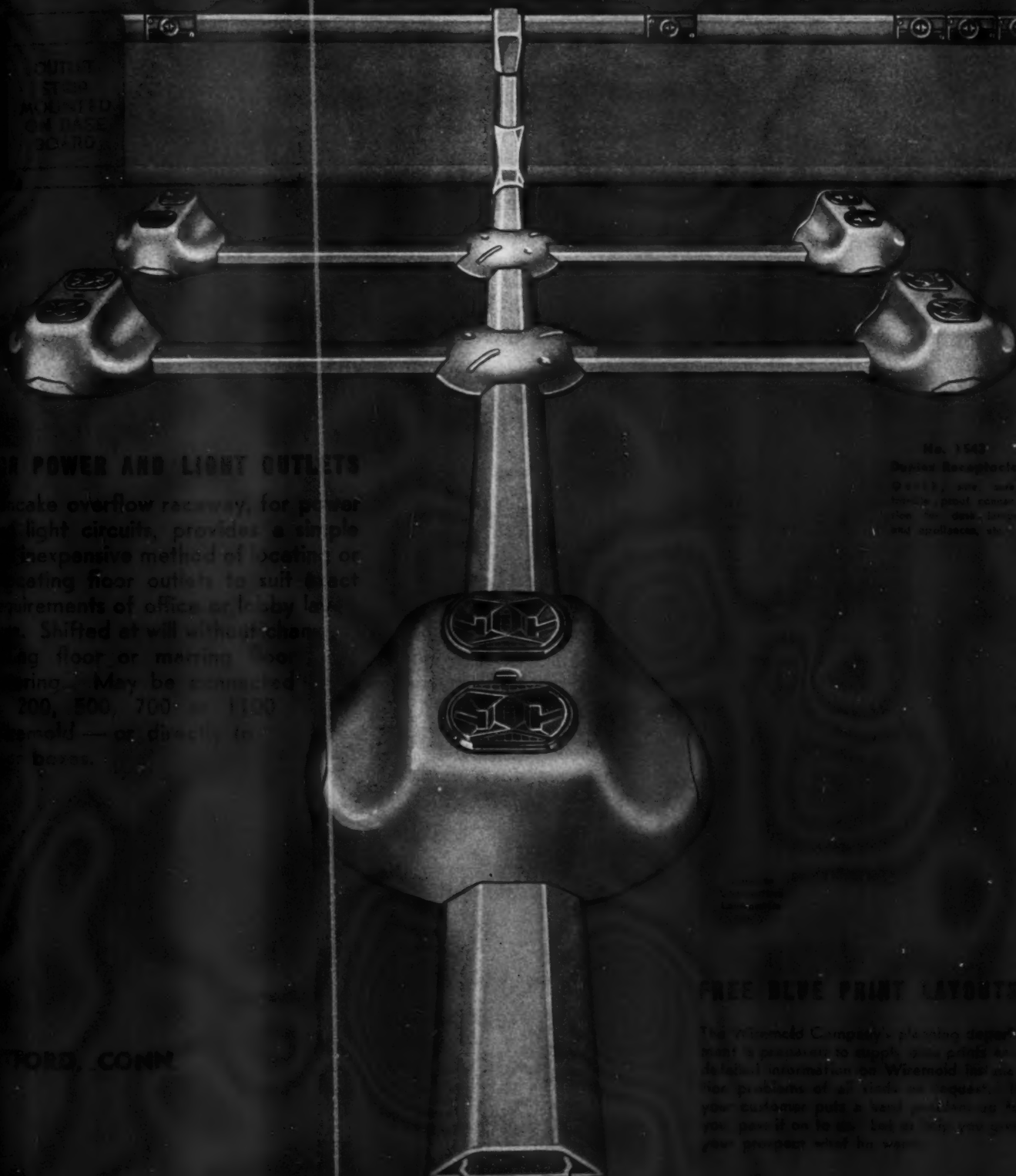
EDUCATIONAL CAMPAIGN!

Through advertisements and making plans, reaching Architects, Engineers, Building Managers and Estate Agents—showing applications of Wiremold to offices, apartment houses, hotels, stores and public buildings.—The Wiremold Company is creating much potential business for the wiremold industry. This is why!

WIREMOLD COMPANY

REATES WIRING JOBS

in many new ones - - by eliminating loose cord nuisance!



OUTLET
TYPE
MOUNTED
ON BASE
BOARD

FOR POWER AND LIGHT OUTLETS

...create overflow raceway, for power
...light circuits, provides a simple
...expensive method of locating or
...floor outlets to suit exact
...requirements of office or lobby lay-
...out. Shifted at will without chang-
...ing floor or marring floor
...ing. May be connected
...200, 500, 700 or 1100
...Wiremold — or directly to
...boxes.

No. 1542
Duplex Receptacle
Outlet, one way,
twelve, ground con-
nection for steel, bronze
and stainless steel.

FREE BLUE PRINT LAYOUT

The Wiremold Company's planning depart-
ment is prepared to supply blue prints and
detailed information on Wiremold for any
size problem of all kinds on request. If
your customer puts a hard problem up to
you pass it on to us. Let us tell you what
your prospect will be sure.

FORD, CONN.



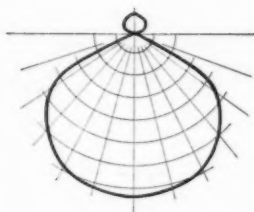
**"THE FIRST REAL ADVANCE IN INDUSTRIAL LIGHTING IN YEARS"—
SAY ILLUMINATING ENGINEERS
ABOUT THE**

DUPLEX DOME REFLECTOR

**WHICH PROVIDES DIFFUSED LIGHT
UPWARD WITHOUT EXPENSIVE AND
FRAGILE DIFFUSING ELEMENTS.**



PORCELAIN ENAMELED WHITE



Distribution Curve

Characteristics are similar to the RLM Standard Dome with a small portion of reflected light diverted upward.

★ The Duplex Dome illuminates the upper walls and ceiling with diffused light and delivers direct light downward. Louvers formed in the metal walls of the reflectors divert sufficient light upward to relieve unpleasant contrast between the bright reflector and dark background. The white porcelain enameled exterior of the reflector and supporting stem are also illuminated.

In addition to the solid neck type illustrated, Duplex Dome Reflectors are also made with heavy threaded socket-hoods to facilitate removal for cleaning. Available for lamps up to 500 watts capacity.

Patented and patents pending.

QUADRANGLE MFG. CO.

**32 S. PEORIA ST.
CHICAGO, ILL.**

MEMBER OF RLM STANDARDS INSTITUTE



Among the
MOTOR SHOPS

[FROM PAGE 54]

motor stock or for the delivery dock at the rear.

The new sheet metal booth in the left foreground is for cleaning motor parts of dirt and grease after disassembly. Vapor-proof lighting and pressure hose connections for solvents are installed within the booth. There is a vertical sliding door at the front and an exhaust fan at the top.

The commutator soldering rack comes next to the right, then a small bench lathe for commutator turning and other light machine work.

TELLING IT TO PLANT ENGINEERS

An attractive little booklet entitled "Plant Engineer's Guide" has just been issued by the Buzzell Electric Works of San Francisco. They have distributed it to plant engineers and building maintenance electricians.

The booklet combines practical motor hints and data, with suggestions for using the service of the Buzzell Electric Works, in case of emergencies or for construction or repair jobs. The first pages deal with hints on motor



PRACTICAL DATA—Pacific Coast motor shop gives plant engineers useful hints and working data.

cleaning, bearings, motor trouble shooting, etc. Power factor explanation and data, tables of switch sizes, carrying capacity of wire, fuse ratings follow.

According to Louis Douat, general manager of this company, the purpose of this booklet is to provide plant engineers with literature that they will keep, for the value of the tables and data contained in it.

Printed on buff stock with a brown cover to resemble the proportions of a book, this 20-page guide measures 3½ in. by 6½ in. overall.

Electrical Contracting, March 1937

Application Installation and **MAINTENANCE**

In Industrial, Commercial and Institutional Buildings

When the "Works" says—

"SAFETY—or else!"

Something Must be Done to Put an End to Hazards

What can the electrical man do to promote safety in the plant? That's the question ELECTRICAL CONTRACTING's Maintenance Editor put to plant engineers in all types of industries during the past month. Answers and examples cited were varied and interesting. They all boil down to "A lot can be done."

Some of the more important points brought up are presented below. We pass them along, because safety is always a "must" item in every plant.

Common Hazards

Common, everyday electrical hazards are the safety-first item most frequently mentioned by plant engineers responsible for electrical operations. These hazards include such things as improper grounding of electrical equipment, "haywiring," wrong type of lighting

fixtures or motors in hazardous locations, inadequate wiring, open-type switches, and the like.

A "rogues gallery" of this sort of thing appears on p. 59. It is surprising how much of this exists in supposedly up-to-date plants. ELECTRICAL CONTRACTING's files are full of snapshots like this, of what *not* to do in the way of wiring and installation.

Perhaps the biggest element of danger in these hazards is that they are not noticed. They are on installations which have been up a long, long time and have become familiar parts of the plant equipment.

Grounding Hazards

In a recent laundry fatality, a short section of flexible conduit had pulled out of its connectors at both ends, or

had been originally too short to reach the connectors. So one of the 550-volt wires had chafed against the edge and the bare copper touched the conduit. A workman closed the switch, which was properly grounded. But he was electrocuted because his bare arm touched the charged conduit when operating the grounded switch lever.

Every plant should have some definite means of guarding against improper grounds. One large packing plant for example with several scattered branches issued a special bulletin explaining what equipment should be grounded, why, and how. It specifically explains the grounding of (1) conduit pipe; (2) motor frames; (3) electric switches and starting boxes; (4) electric heaters; (5) transformer cases; (6) portable equipment; and (7) transformers used for electric branders.



LIGHTING THE WAY TO SAFETY—Scene: Buffing room. Act I: Average illumination only 5 foot-candles; glare; deep shadows; accident hazards in dark aisles. Act II: Modern lighting gives 40 foot-candles; no dangerous shadows; no glare; more light stimulates neatness and increases safety.

CHECK CHART ON SAFETY

CHECK POINTS	WHAT TO LOOK FOR
DISTRIBUTION AND WIRING	<ol style="list-style-type: none"> 1. Are transformers in an enclosure, and is the entrance locked at all times? 2. Are transformers equipped with devices to indicate heating conditions? 3. Are dead-front panel boards and switchboards, or fuseless circuit breakers used wherever feasible? 4. Has makeshift wiring been removed or replaced with a permanent installation? 5. Have feeders and circuits adequate capacity for loads throughout the plant? 6. Are feeder and branch circuits protected with overload devices in accordance with N.E.C. capacity ratings? 7. Are fuse pullers immediately available? 8. Is the distribution system grounded?
LIGHTING	<ol style="list-style-type: none"> 1. Are aisles, corridors, stairways, yards sufficiently lighted? 2. Are explosion-proof fixtures used in all hazardous locations? 3. Are weatherproof fixtures used where equipment is exposed to the elements? 4. Are reflectors and lamps easily accessible for cleaning, and are they cleaned regularly? 5. Can lamps be replaced without using a ladder or a makeshift device? 6. Is special, localized lighting needed on cutters and other dangerous equipment?
MOTORS AND DRIVES	<ol style="list-style-type: none"> 1. Do all motors have proper ground connections? 2. Are inclosed motors used in dusty locations? 3. Have explosion-resisting motors been installed in hazardous locations? 4. Can motors and control be isolated from hazardous conditions? 5. Do connections interfere with motor removal, control maintenance, adjustment of drive? 6. Do all belts and gears have guards, and when were the belts inspected for wear? 7. Do any motors or drives project dangerously into aisles?
CONTROL	<ol style="list-style-type: none"> 1. Are push buttons quickly accessible in emergencies? 2. Is overload and undervoltage protection provided? 3. Has an inspection been made for loose connections and defective contacts? 4. Will a condenser connected across terminals of a solenoid help reduce sparking at switch? 5. Will electrical interlocking insure proper sequence of operations? 6. Should machine operations be controlled from a central point? 7. Are there signals on all dangerous equipment to show when it is in operation? 8. Do heavy-duty resistors have sufficient ventilation?
SPECIAL SAFETY DEVICES	<ol style="list-style-type: none"> 1. Can photo-electric control be used for protection to machine operators? 2. Is throwover control used for emergency lighting? 3. Are signals and alarms correctly located and functioning properly? 4. Are lamp-guards in good order? 5. Are suitable signs and tags used to indicate that men are working on a particular circuit? 6. Are portable devices polarized and arranged for ground connection? 7. Are instruments available for regular insulation tests?

Lighting Hazards

Volumes have been written about the need for good industrial lighting to promote efficiency and eliminate eye-strain. The part played by good lighting in promoting safety is fully as important. The illustrations on page 59 show what can be done.

In the picture to the left see how the buffing room in a middle western plant used to look with 4.9 foot-candles average illumination. Glare was reflected into the workers' eyes from the shining surfaces of parts being polished. At the right is shown the same room with the illumination raised to 40 foot-candles, and proper fixtures installed. There are no contrasts of bright light, no darkness to tire the eyes. The higher level of the lighting units minimizes glare.

It is also obvious that with the brighter illumination the room is kept in better order. And aside from the great benefits in the matter of efficiency, the safety moral is fully apparent. Workers can now see where they are going and what they are doing.

Interlocking Helps

Often a simple electrical interlocking system will prevent serious accidents. For instance, in a Cleveland manufacturing plant, two cranes and a hoist operate on d.c. while the rest of the equipment is on a.c. To prevent payment for both a.c. and d.c. power service, an m.g. set was installed.

Originally the m.g. set was started and stopped from one push button station. On several occasions the set was shut down while the crane, which is equipped with an electric brake had a load in mid-air. Near-serious accidents resulted.

Pushbutton stations for remote control of the m.g. set from several stations in the plant were then installed. Interlocking was arranged in such a way that the set can be started from any point and power is saved by not having it run all day long. But it cannot be stopped as long as any d.c. equipment is in operation.

Another example of electrical interlocking for safety is found in the plant of the Muirson Label Company, Brooklyn. There a long conveyor passes large sheets of freshly varnished labels slowly through a drying chamber.

Electrical interlocking is such that the operator of the varnish-application machine cannot start his equipment before the blowers on the dryer have been set in motion to protect the worker, by carrying off the fumes from the drying chamber.

(Continued on page 62)

"The Rogue's Gallery"

Horrible Examples of Avoidable Electrical Hazards from Electrical Contracting's Files



THE TNT KID

Spray Booth—Illumination provided by a bare lamp on a drop cord. Light is directed by misfit reflector and piece of paper. Reflector tied to socket and allowed to contact metal frame. 1 short=1 explosion.



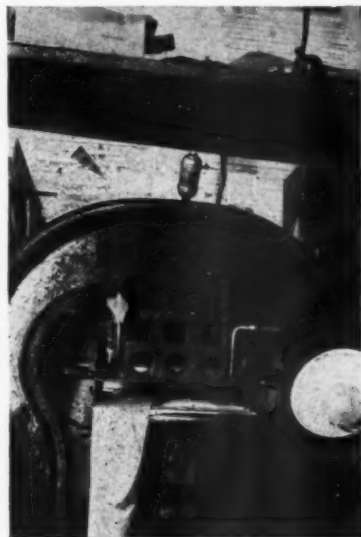
ALLEY RAT

Acid Process Room—Bare lamps and extension cords, draped on overhead water pipes and wooden braces. Explosive hazards, in addition to glare and shadows. Dark alleys like these breed industrial accidents.



LITTLE DUSTER

Food Processing Plant — Light switches and fuse blocks on a 220-volt circuit, mounted in an inclosing case. Door permitted to remain open. Note collection of dust in case and on "live" parts.



BIG NAIL CHARLIE

Celluloid Embossing Press—Power received from lamp cord wrapped around nail. Case of cord switch, if "alive," could ground on metal frame of press. Adjustable lamp cord equipped with bare lamp. Just a hay wire job.



THE CORNER GANG

Shop Building—At corner of this building, six power and lighting conduits are installed close together not more than 9 ft. above the ground. Conduit loose from wall, conduit supported by service wires, and broken entrance fittings.



WILLIE THE SPARK

Woodworking Plant—Saw operated by 1/2 hp. 110-volt motor, controlled by snap switch at far left corner of saw base. Loose wiring from motor along outside of framework enters porcelain base beneath blanket of saw dust.

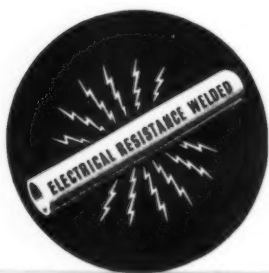
ELECTRUNITE

REG. U. S. PAT. OFF.

● Some years ago, Steel and Tubes engineers set out to design a raceway made especially for wiring—a raceway that would meet every need of the contractor, the architect and the home owner.

They knew that the tubing should be strong to protect wiring—light for ease of handling and elimination of the cost of excess metal—ductile for easy working—threadless to save installation cost—electro-galvanized to provide uniform, lasting resistance to corrosion.

In 1929, seven years ago, Steel and Tubes, Inc., offered the result of their research and experimentation—the original electric resistance welded electrical metallic tubing designed specifically to protect wiring, to simplify installation and to reduce cost—ELECTRUNITE Steeltubes.



ELECTRUNITE Steel-tubes is made from high quality open-hearth steel . . . cold-rolled . . . cold-formed . . . electric resistance welded by the same patented process used in making more than a billion feet of tubing.



Since that time many improvements have been made, probably the most notable of which is the patented knurled inside surface that makes wire pulling approximately 30% easier. Since then, too, more than 150,000, 000 feet have been installed in every type of installation—proof that Steel and Tubes engineers were highly successful in their undertaking—proof that ELECTRUMITE Steeltubes, although radically different from old-style types of raceways, is no longer a new or untried product—proof of its nationwide acceptance and approval.

ELECTRUNITE Steeltubes is stocked by leading electrical wholesalers who are ready to give you prompt service. Steel and Tubes field men in all district sales offices are at your disposal to assist you in obtaining more jobs at higher profits. Ask your wholesaler or write us for further information.

ELECTRUNITE Steel-tubes is available with the knurled inside finish (patent No. 1,962,876) in $\frac{1}{2}$ ", $\frac{3}{4}$ ", and 1" sizes. It is fully approved by the Underwriter's Laboratories and most up-to-date ordinances.



ELECTRICAL DIVISION

Steel and Tubes, Inc.

WORLD'S LARGEST PRODUCER OF ELECTRICALLY WELDED TUBING

CLEVELAND OHIO



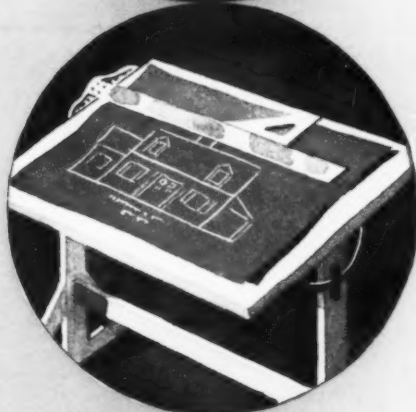
Steeltubes

*was designed to
meet the needs of-*

THE ELECTRICAL
CONTRACTOR



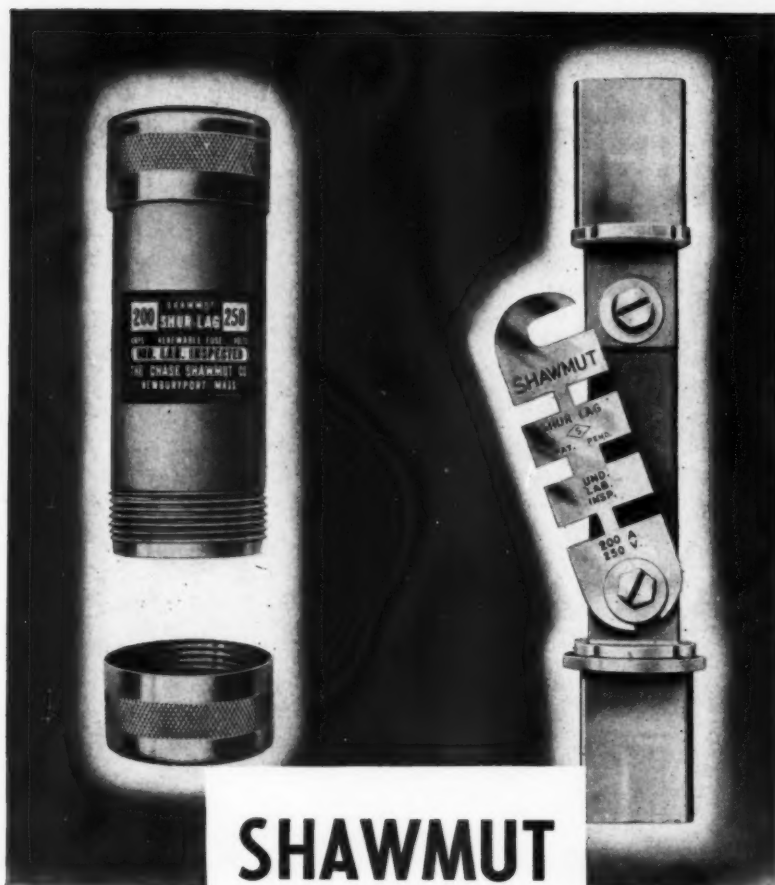
THE ARCHITECT



THE HOME OWNER



-for protection to wiring



SHAWMUT SHUR-LAG RENEWABLE FUSES

★ Shawmut Shur-Lag Renewable Fuses provide greater time lag under unusual overloads.

★ Sturdy construction and permanent rigid blade alignment. Blades are assembled to extra heavy insulating crossbar.

★ After blowing fragments of links can be quickly removed and new links inserted from either end of fuse case.

★ No small parts to become lost or mislaid—simple, sturdy and efficient in design.

THE CHASE-SHAWMUT CO.
NEWBURYPORT, MASS.
FUSE SPECIALISTS SINCE 1893

Safety—

Or Else [FROM PAGE 58]

Also gas furnaces are used as auxiliaries to steam heat. When steam is shut down, these gas furnaces are started automatically.

"Electric Eyes" for Safety

Application of phototubes in safety work are becoming more and more numerous. Rugged light sources and phototube units are now available which are hardly more trouble to install than ordinary conduit fittings and lighting fixtures. Most common applications are on machines such as cutters and presses where a light beam is interrupted if the operator's fingers get too close to the mechanism. Interrupting the beam sets relays which shut off the power.

Another type of safety application using the electric eye is employed in a chemical manufacturing plant. It is used in connection with a metal-melting oil furnace, and provides immediate protection in case the flame is extinguished. The furnace operates continually, and there is no automatic pilot flame. Because of the high temperatures at which the furnace operates, a thermostatically controlled valve was impractical.

A Weston "photronic" cell (which requires no amplifiers or external source of electrical energy) is mounted about a foot back from an opening in the furnace wall, in view of the oil flame. A perforated metal prevents accidental interruption of the light from the flame which falls on the cell.

Under normal operating conditions, the current generated by the phototube maintains a sensitive relay in an open position. Should the oil flame fail, the relay closes, and a power relay shuts the oil flame.

The protection is particularly important during the night when the furnace is without supervision.

Automatic doors at the Fiberloid Manufacturing Company, Indian Orchard, Mass., offer another example of an unusual phototube safety application. The company manufactures highly inflammable materials, and only one or two departments are in one building. Most of the trucking in the plant is over ramps and bridges from one building to another.

The doors have pneumatic operators equipped with photo-electric relays. When a light beam at the approach is interrupted, the doors open. Where double doors are used, both open at the same time in opposite directions.

This method permits continuous passage through the door, and an unobstructed view of traffic approaching from the opposite direction.

Electrical Contracting, March 1937



GAINING SPACE—Use of edge-wound resistors will often increase accessibility and provide more room for other purposes on control boards. This storage battery control board was built for a Pacific Coast storage battery company.

Keeping an Eye On The Plant

At an acid plant in East Providence, R. I., five indicating ammeters were mounted on a board at a central place. The ammeters are connected in motor circuits in different parts of the plant and show if all pumps are carrying their respective loads.

Three other electric indicating instruments on the same board, with thermocouple connections, show temperatures of molten sulphur and sulphuric acid at different places in the plant. Tube pressure gages, located at the same place, indicate gas pressures at various points. By centralized mounting of the meters, instruments and gages all process steps can be checked by one attendant.

Prevent Belt Trouble

Inserting blocks under the motor mounting and raising the equipment up from its foundation will often permit a belt to be run without striking adjacent parts. A recent example of this was on an installation in a pulp and board mill.

A beater on the first floor was driven by V-belts running through the floor from 100-hp. motor on the second floor. A larger pulley was installed to reduce the speed of the drive on the first floor, but the change in size of pulleys caused the belt to scrape the motor mounting. At an estimated cost of \$150 part of the base could be cut away. An electrical contractor walking through the mill on other business noticed the trouble and offered the suggestion to put blocks beneath the motor. The trouble stopped.

No More Burned Out Bearings!

A plant superintendent has informed us of an arrangement which has eliminated trouble with burned-out bearings. It has been in operation for the past several years, and has made a remarkable record—only one burned out bearing in 135 motors.

Too much belt tension between motor

and countershaft was the cause of the bearing trouble. Adjustments were made by department employees, and no one was penalized for a poor job.

Now the electrician is responsible for all adjustments of belt tension. The usual method to take up slack is to move the motor on its rails or base plate. Shortening of the belt is done by a millwright who is called in by the electrician. The electrician is "on his toes" and knows that the belts must have the proper tension, otherwise he may have to do some hard work in a very short time.

What's the Load?

Sometimes it is necessary to make quick calculations to determine the approximate ratio of average load to connected load or the power consumption of a motor. The following methods may be used, based on a 1-hp. motor consuming 175 kw.-hr., when operated continuously at rated loads for 25 eight hour days.

Example 1—To determine the ratio of average load to connected load for a 10 hp. motor, run 8 hours a day for 25 days.

Watt-hour-meter reading at end of the period (25 days) is 1,050 kw.-hr. for this motor.

better

VENTILATION

means better work

ARCHITECTS, builders, property owners, employers and operators all agree that proper ventilation is necessary to obtain best results from workers. An investment in exhaust fans is really an economy since increased health protection and efficiency result.

The exclusive design of Peerless Multiblade Fans insures quiet operation with large air capacities and low power consumption. Motors are fully enclosed to exclude dirt and moisture. They operate continuously without overheating. Single and three speed fans for restaurants, offices, factories, and similar buildings.

Write for complete details

Peerless

MULTIBLADE EXHAUST FANS

THE PEERLESS ELECTRIC CO.

WARREN, OHIO

Hey, Toots, I've
been here for
hours and I'm
still all wet

She was all wet
when she came in

It's that dryer!
PHONE THAT
TALL, HANDSOME
ELECTRICIAN



HERE'S YOUR BIG MOMENT...

THEY NEED YOU AND AN OHIO CARBON BRUSH

Be ready for emergency calls from people with weak dryers, and limpy motors of all sorts. An Ohio Carbon Brush will usually put these motors on their feet, and get you in on plenty of repair jobs, which is very profitable business.



Stock Ohio Carbon Brushes, and satisfy yourself by satisfying your customers.

THE OHIO CARBON co.

12508 BEREA ROAD • CLEVELAND, OHIO

The average load (1,050 kw.-hr. divided by 175 kw.-hr.), is 6 hp.

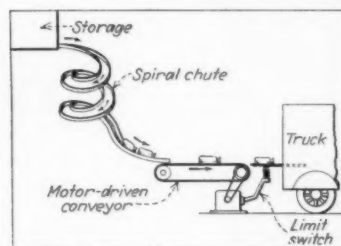
The ratio of average load to connected load (6 hp. divided by 10 hp.), is 60 per cent.

Example 2—To determine the approximate kilowatt-hours consumed by a 10 hp. motor, operating for 25 eight-hour days, with an estimated ratio of average and connected load of 60 per cent.

Power consumed: 10 hp. (connected load) multiplied by 0.60 (estimated ratio) multiplied by 175 (kw.-hr. per hp.), or 1,050 kw.-hr.

Costs Cut With Limit-Switch

Material handling was a large item of the total cost in the bagged products plant and warehouse of the International Milling Company, Buffalo, N. Y. At least two men were always needed on a truck or freight car that was being loaded by a conveyor. One man had to be ready to receive the bags



LIMIT SWITCH CONTROL—Starts and stops motor driven conveyor and cuts bag loading cost in half.

as they arrived at the discharge end of the conveyor.

After a study of this costly operation it was decided to install a limit switch at the discharge end of the conveyor to start and stop the conveyor. Bags now from storage descend a spiral chute, designed for smoother production and avoiding delays, to the conveyor where the bag is carried to a platform. The weight of the bag operates the limit switch which in turn stops the conveyor motor. When the bag is removed the action of the spring causes the limit switch to close the electrical circuit and automatically starts the conveyor motor. The conveyor is in operation again until another bag is delivered on the platform.

This arrangement has considerably reduced the breakage of bags at the discharge end of the conveyor, saved 50 per cent in cost of loading, and made possible one-man loading of a truck or car. In case the loading must be done in a short time, the equipment will operate fast enough to keep four or five men busy.

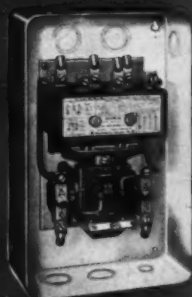


"Somebody told Philbert there was silver in those contacts!"

Philbert is right! There is silver in the contacts of Allen-Bradley solenoid starters—plenty of it! And, there are two contacts per pole. Oxides that may form on these silver alloy contacts conduct current as well as the metal itself. The Allen-Bradley silver alloy contacts must not be cleaned or dressed. You can throw away your file and sandpaper when you install Bulletin 709 solenoid starters. Filing wastes useful contact life. As Allen-Bradley solenoid contacts never need filing, they outlast many ordinary copper contacts. What's more, they are always in first class operating condition. Write for literature,

ALLEN-BRADLEY

SOLENOID MOTOR CONTROL



Bulletin 709 solenoid starter, used for three-phase motor control systems.

A 5-POINT CHECK LIST FOR MOTOR STARTER BUYERS

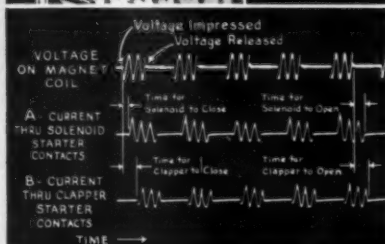
✓ MAINTENANCE-FREE

The double break, silver alloy contacts on Allen-Bradley solenoid starters never have to be filed or dressed. There are no pivots and bearings to stick. There are no flexible jumpers to break.



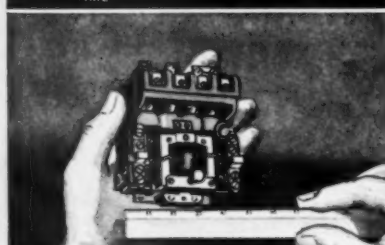
✓ FAST, CONSISTENT OPERATION

Allen-Bradley solenoid starters operate practically without friction. There are no bearings to stick. Consequently, the starter is exceptionally fast and consistent in closing and opening—the ideal starter for production machinery.



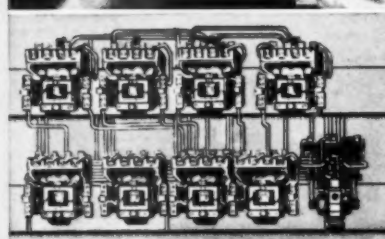
✓ SMALL IN SIZE

Though they easily break currents not less than ten times their maximum horsepower rating, these Allen-Bradley starters are the smallest on the market. Yet they are extremely rugged. Millions of operations are built into each starter.



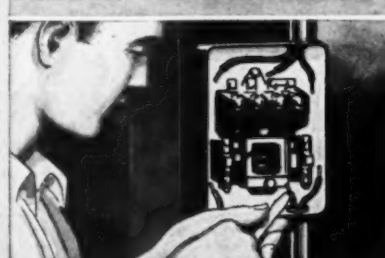
✓ IDEAL FOR BUILT-IN CONTROL

Unit construction of Allen-Bradley solenoid starters permits quick and easy mounting on special control panels. Starters can be mounted directly to metal surfaces without additional insulation. There is no danger of arc flashovers.



✓ EASY TO INSTALL

All wiring is accessible from the front. Cabinets have generous wiring space, white interiors, and plenty of knockouts.



Send coupon to Allen-Bradley Company,
1321 S. First St., Milwaukee, Wisconsin

THERE IS A BULLETIN 709 FOR EVERY SERVICE

THREE FORMS



Form 1 with built-in "start-stop" button.



Form 2 for remote control. Plain cover.



Form 3 with 3-way "auto-off-hand" switch.

SEVEN ENCLOSURES

General purpose. Type A (NEMA Type 1) sheet metal enclosure.



Water-tight. Type B (NEMA Type 4) heavy cadmium plated cast iron enclosure with rubber gasket seal.



Dust-tight. Type D (NEMA Type 9) cast iron enclosure for Class 2, Group G hazardous locations.



Dust-tight. Type E (NEMA Type 5) felt gasketed sheet metal enclosure for non-hazardous dust.



Explosion-proof. Type G (NEMA Type 7) enclosure for Class 1, Group D hazardous gas locations.



Explosion and corrosion-proof. Type H (NEMA Type 8) cast iron enclosure. Oil immersed switch.



Corrosion-proof. Type J enclosure for use in corrosive atmospheres. Switch is oil immersed



NEW BOOKLET

Please send me your new free booklet
"The Story of the Solenoid Starter."

Name

Company

Address

City

State



ALLEN- BRADLEY

THREE SIZES

MAXIMUM POLYPHASE RATING

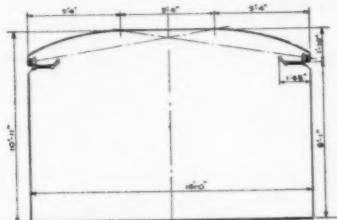
SIZE 1—5 hp, 220 volts
7½ hp, 440-550 volts
SIZE 2—15 hp, 220 volts
25 hp, 440-550 volts
SIZE 3—30 hp, 220 volts
50 hp, 440-550 volts

BULLETIN 709 SOLENOID STARTERS

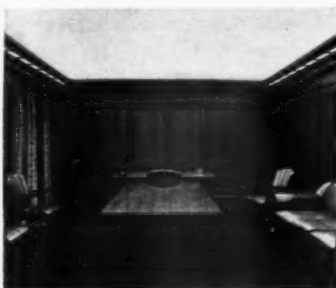
For Better LIGHTING JOBS

TO LIGHT A DIRECTORS ROOM

The Buffalo, Niagara and Eastern Power Corporation recently installed a modern lighting system in the directors room of the Hygrade Petroleum Corporation. The room, which also serves as the president's office, is 16 feet wide,



CONSTRUCTION—Floodlights concealed behind cornice do the trick.



GRILLED CORNICE—A soft ample light installed without cutting panels.

27 feet long and has a maximum ceiling height of 10 feet 11 inches. The ceiling is sanded plaster, painted white with a reflection factor of 80 per cent and slightly arched. The walls are walnut with a reflection of 15 per cent.

The level of illumination decided upon was 20 footcandles in service. They wished to eliminate pendant fixtures and floor portables, so it was necessary to use either wall urns or cove lighting. They chose to avoid breaking the walnut panels. Because of the low ceiling, to conceal the equipment was difficult

without employing a cornice that was too conspicuous.

The cornice employed extends only 1 foot 8½ inches from the wall and is broken up into grilled panels, covered with sheets of dense opal glass. It runs around the four sides of the room and along the side walls conceals Curtis mirrored glass concentrating cove lighting reflectors equipped with 60-watt lamps and mounted on Curtis-strip on 9 inch centers. The cornice at each end of the room contains eight 60-watt clear Lumiline lamps in Curtis Light Strip Assembly tilted at 10 degrees above the horizontal.

Illumination measurements taken the day the installation was completed showed an average of 35 footcandles with practically no variation up to a point within two feet of the wall, at 2½ feet above the floor.

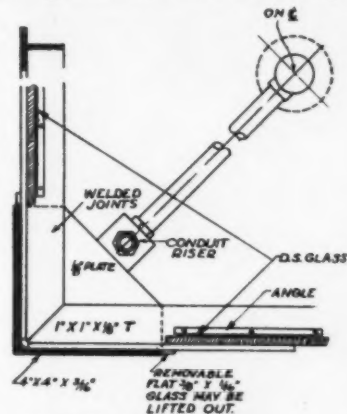
GAS STATION LUMINOUS PYLONS

Gasoline stations must impress speed-ing motorists with brand and location as they approach. Luminous pylons are seen and read from afar, and provide distinctive, repetitive and spectacular advertising. Their size makes them unique. They may mark the yard and help light it. Yet they are economical to operate.

The Pocahontas Oil Company of Cleveland has found pylons effective. They were built by Irwin-Walker Displays, Inc., of Cleveland.

Construction: Frames are of large metal angles, with narrow cross T-bars and heavy corner gusset plates, all welded together. Verticals are imbedded in heavy concrete bases. One is square in section, with four glass sides; the other an equilateral triangle, with the two street sides glass. Metal interior parts are finished in white, with aluminum outside. Width of sides 2 feet, height about 20 feet.

All glass is highly diffusing ceramic coating, white with black letters, all per-



CORNER ASSEMBLY—Showing construction of pylons, similar for either square or triangular models.

manently fired into double strength (½") clear glass. Most of the glass panels measure 21"x19½" and are held by metal strips which are removable for maintenance.

Lighting: For best legibility, pylons should be uniformly lighted. Lamps are mounted base up in one vertical row along center line of pylon, as follows:

No. of Shaft Lamps	Vert. Spacing	Watts per Lamp	Total Watts
Square 11	19"	100	1100
Triangle 21	9½"	60	1260

Conduit riser is in one corner to



EYE CATCHER—Four sided luminous pylon that sells Blue Flash. Another similar model has three sides.

WHY TURN LOX



BOTH

Lamp and Reflector are detached as ONE UNIT by a slight upward pressure and a quarter turn.



3 POINT BAYONET COUPLING

- Positive lock.
- Immediate connection.
- No prongs or contacts to locate.
- Automatic Polarization.

SELF CLEANING CONTACTS

- Contacts are cleaned as the reflector is turned into hood.

SPIRAL COMPRESSION SPRING

- Insures positive electrical connection.



EASY TO WIRE

- Nothing in way or hard to reach.
- No screws to remove.



is THE ANSWER

to the problem of maintaining RLM Efficiency Standards



RLM stands for certain high standards of illuminating efficiency which are certified by the Electrical Testing Laboratories of New York to be met by all products bearing this label.

Dirty reflectors which waste from 20% to 80% of their RLM efficiency are a challenge to the electrical industry which can only be met by providing installations which encourage frequent lamp and reflector cleaning...

TURNLOX is Benjamin's answer to the challenge... an answer that gives further evidence of Benjamin's leadership. This unique and exclusive Benjamin construction encourages frequent cleaning because it reduces maintenance costs and simplifies cleaning and inspection. Illustrated on this page are the salient features which have made TURNLOX, the industry's outstanding answer to the maintenance problem. Your inquiry for complete details and data on all types of Benjamin Reflectors which are furnished with TURNLOX hoods, is cordially invited.

BENJAMIN

TRADE MARK

BENJAMIN ELECTRIC MFG. CO.
Dep't EC, Des Plaines, Ill.

Send me complete details on
TURNLOX.

(Print name and address below)

THE Blade
to CUT BX-
Wire Mold



MILFORD FLEXIBLE

The Blade with the
EASY-STARTING TEETH

A quick, clean start.
No slipping on the cutting line.
Teeth will not catch in corners.
A smooth finish. Longer Wear.

MILFORD FLEXIBLE is a tough tungsten blade with file hard teeth. It will not snap in a frame, and is safe for an electrician to use in cutting over the knee, or in cramped quarters.

Ask your jobber for

MILFORD FLEXIBLE

The Blade with the
EASY-STARTING TEETH

THE HENRY G. THOMPSON
& SON CO.

NEW HAVEN, CONN.

Saw Makers for over Half a Century

For Better LIGHTING JOBS

[FROM PAGE 67]

eliminate shadows on glass. Horizontal conduit nipples support the sockets. Flaring surfaces at top are sheet metal, orange-colored finish, lighted by concealed 40-watt inside-frosted lamps. Wattage, square pylon 320; triangular 270.

A SILHOUETTE THAT SELLS

Merchandising methods and store interiors both have seen the value of modernization. So there is more remodeling of store fronts, in which illumination sends its appeal to the public after dark.

Luminous elements provide the needed interest. Built as an integral part of the structure, they offer three distinct advantages: first, impressiveness and refinement; second, advertising individuality; and third, cheer and invitation to an otherwise darkened location.

Luminous elements may be applied quite readily to old buildings when remodeling is undertaken as in this Watkins Furniture store installation. A metal canopy 112 feet long carries, upon luminous glass, changeable letters calling attention to current values, also markers for one of the Cleveland Trust Co. branch offices. Upon this metal canopy, too, rest huge letters, seen in silhouette against a lighted surface of light-painted brick.

The canopy element contains 170 25-watt lamps on 8-inch centers directly behind the glass, with white reflecting surfaces behind them. By sliding the panes of glass, the lamps can easily be replaced. The letters are attached to narrow horizontal bars in front of the glass and are easily changeable.

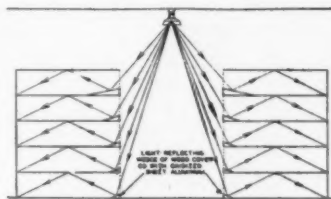
The large sign contains approximately 480 25-watt A-19 lamps located in the letter strokes. The lamps are on 8-inch centers approximately 17 inches in front of the background. The total depth to the face of the letters is 20 inches.

The contractors were Hadlock Krill Co. The architects, Hays & Simpson, and the signs and luminous elements were made by Brilliant Electric Signs, Inc., all of Cleveland.

TO LIGHT A STORAGE BIN

Clever lighting for a storage bin was evolved by the Committee on Industrial and School Lighting of the Illuminating Engineering Society. It came out of a survey of the shoe manufacturing industry.

The bins in the plant have a 3 foot aisle between them. Light from over-



FOIL REFLECTORS—Bins painted aluminum are lighted from wedges that reflect light from above.

head units, with an asymmetric type of distribution, adequately light the front section of the bin. But, the back part remains in comparative darkness.

To provide light at the back of the bins, from the overhead system, the interior of the bins were painted with two coats of aluminum paint. Also, wedges of aluminum covering were laid across the base of each bin at the front, and securely fastened with carriage bolts to the base of the bin.

With this arrangement the light from the overhead units strikes the ramp incline of the wedge and is reflected to



LUMINOUS ADVERTISING—A store front sign combining name and special changeable announcements in two forms of silhouette.



For further information about RLM Reflectors and a copy of the RLM Standards Specifications for Dome Reflectors, you are invited to communicate with any of these manufacturers of RLM Standard labeled reflectors. The letters RLM mean Reflector and Lighting Equipment Manufacturers.

ABOLITE REFLECTOR COMPANY
West Lafayette, Ohio
BENJAMIN ELECTRIC MFG. CO.
Des Plaines, Illinois
GOODRICH ELECTRIC COMPANY
Chicago, Illinois
THE MILLER COMPANY
Meriden, Connecticut
OVERBACH AND AYRES MFG. CO.
Chicago, Illinois
QUADRANGLE MFG. COMPANY
Chicago, Illinois
WESTINGHOUSE ELECTRIC AND
MFG. COMPANY
Cleveland, Ohio
WHEELER REFLECTOR CO.
Boston, Massachusetts



How the RLM LABEL

helps you to Secure Efficient and Effective Lighting

Essential to Efficient and Effective industrial lighting are these three important factors. 1. BALANCED LIGHTING; 2. LOW REPLACEMENT AND MAINTENANCE COST; 3. REFLECTORS OF UNIFORM QUALITY. These are the basic things for which the RLM LABEL stands. To secure them, insist upon reflectors with the RLM LABEL, when purchasing or specifying industrial lighting equipment.

1 BALANCED LIGHTING

Lighting efficiency cannot be measured alone by the *quantity* of light output delivered by the reflector. It is equally important that this light be *evenly distributed and diffused*. There is no economy in securing maximum light output at the expense of well diffused lighting which con-

tributes so much to the workman's efficiency. Essential to balanced lighting is a reflector which adequately diffuses and distributes the light from the lamp. RLM porcelain enamel reflectors produce a softer and better diffused light without sacrifice to necessary high reflection efficiency.

2 LOW REPLACEMENT AND MAINTENANCE COST

For economy as well as efficiency, RLM Standards specify a reflecting surface of highest grade of porcelain enamel. Durable . . . impervious to atmospheric conditions . . . this mate-

rial makes replacement costs negligible. And because its surface does not become porous, it is dirt resisting and is easily cleaned. Maintenance costs are, therefore, at a minimum.

3 REFLECTORS OF UNIFORM QUALITY

The RLM LABEL on the reflector you specify or purchase is your warranty of uniform high quality. To insure this uniformity, rigid inspections and tests of

RLM labeled reflectors are continuously conducted by an independent organization, the ELECTRICAL TESTING LABORATORIES of New York.

RLM STANDARDS INSTITUTE

INCORPORATED

THE CERTIFICATE OF



UNIFORM QUALITY

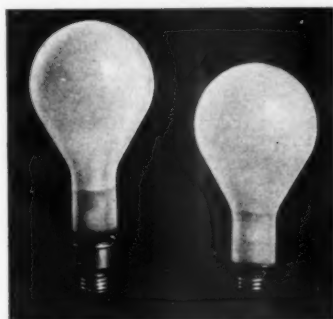
For Better LIGHTING JOBS

[FROM PAGE 49]

the walls and ceiling of each bin. It has increased the level of illumination in the bin interior by as much as 50 per cent.

SMALLER AND BETTER

The new 300-watt Mazda lamp with regular medium screw base, has been developed to use in fixtures now employing the 200-watt lamp. The medium skirted base on the



GROWING DOWN—The new 300 watt medium screw base beside the skirted base Mazda it has replaced.

standard 300-watt lamp was $\frac{1}{2}$ -inch longer than the mogul base lamp.

The new bulb, which has the same diameter as the present 300-watt bulb, is larger than that of the 200-watt bulb. But this size is necessary to insure good candlepower maintenance in this wattage.

Because of its short light center length, (6") this new 300-watt Mazda can be satisfactorily used in most sockets where 200-watt lamps are now employed. The user, however, should be cautioned not to substitute this lamp for the 200-watt size where the glassware is so small that objectionable glare will result. Also the new lamp is expected to supersede the 300-watt medium skirted base lamps.

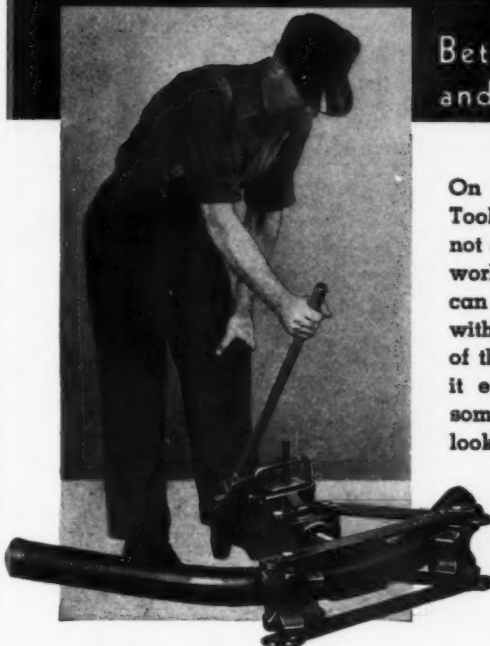
For new installations it is not generally recommended that fixtures with medium sockets be purchased. It is wiser to select mogul base equipment and insert an inexpensive socket adapter. This will make it possible to use a 300-watt medium base lamp now and step up to the 500-watt size later without any expense.

Electrical Contracting, March 1937

Use GREENLEE TOOLS

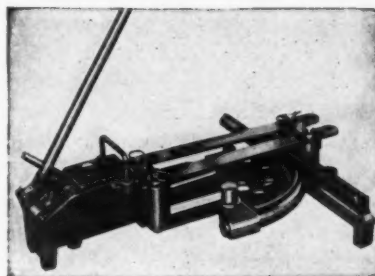
FOR

Better Wiring Jobs
and Greater Profits



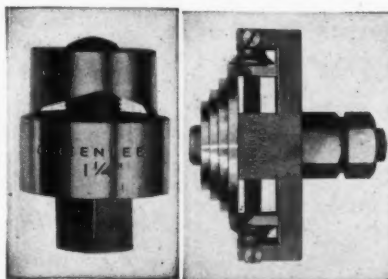
Hydraulic Benders

Above is the Rigid Conduit Bender in action. It is readily portable and simple to operate. Bends made with it are smooth and accurate, with very little distortion in the metal. No. 770 bends all sizes from $1\frac{1}{4}$ to 3". The large bender, No. 775, handles all sizes from $2\frac{1}{2}$ to $4\frac{1}{2}$ ". The No. 770-T Thin-Wall Steel Conduit Bender is shown to the right. Same as No. 770 but with attachments for bending $1\frac{1}{4}$, $1\frac{1}{2}$ and 2-inch thin-wall conduit.



Knockout Tools

Greenlee Knockout Punches and Cutters are labor-saving devices to a much greater extent than their simple appearance would indicate. They eliminate all reaming and filing in the enlargement of holes for conduit in switch boxes, etc., and they perform the operation in a fraction of the time required by other methods. Punches come in two sets for conduit from $\frac{1}{2}$ to 2-inch. The cutter is for all sizes from $1\frac{1}{2}$ to 3-inch.



GREENLEE TOOL CO., Rockford, Illinois

..... Mail This Coupon To-day.....

GREENLEE TOOL CO., ROCKFORD, ILL.

Please send information on the following tools:

☐ Rigid Conduit Benders ☐ Thin-Wall Conduit Benders ☐ Pipe Pushers
☐ Knockout Tools ☐ Joist Borers ☐ Electricians' Bits ☐ Bit Extensions

Name Address.....

City State.....

My Jobber is..... 3-37

March EDITORIALS

Earl Whitehorne Editor

Call In Old E Pluribus Unum

It seems a pity that there should be two organized groups of motor repair shop men, neither strong enough to lead the industry in any broad program. Both being in the same business, with the same problems to solve, the same interests to further and defend, they ought to get together.

It all happened during the code days. Some of the motor shop men did not want to be herded with wiring contractors. So they formed the National Industrial Service Association. The others were in the Motor Section of NECA. Now the code is in the grave yard with other lamented hopes and fears. But the two groups continue apart.

The question as to who should join which is secondary. It does not matter much. The vital concern is that our old friend *E Pluribus Unum* be put to work, that this large important service industry be united full strength in constructive progress, through research and cooperation.

A joint committee of both groups should study this situation and find the solution. Any arrangement that will be of most benefit to the most motor shops is the right answer.

Unsung Heroes of the Flood

Another devastating heart breaking flood—and again the electrical contractor, the motor shop and the plant electrical forces of factories have done a heroic job. Unknown to the public, the raging waters unloosed the demon of short-circuited-power, ready to kill. These men fought and subdued him and when the waters fled, returned him to his accustomed task—the unceasing service of the people.

As the river rose in the Ohio and Mississippi Valleys, in every stricken city these electrical men jumped to

the aid of the inspectors and the power companies, cut off the power from wet wiring and saved innumerable lives. But when the crest had passed, then their real work began—to restore the service quickly, step by step, behind the receding tide, to bring light and heat and power back again to relieve the woe and desolation that the river wrought.

First comes the quick installing of temporary wiring to provide the bare necessities of emergency service to buildings. Then damaged wiring must be replaced. Water soaked conductors must be pulled away and conduits swabbed out. Motors, controllers, transformers must be cleaned, baked, tested and perhaps rewound. Panels and switchboards must be rebuilt, where slate is flaked off or metals corroded or fibre swollen. Every available skilled workman is pressed into service and day and night the work goes on.

Finally long weeks after the river has returned to its banks, these sensitive electrical nerves and muscles by which the modern city lives, have been restored once more to health and order. Meanwhile, of course, the shops of the contractors and motor repair companies are too often themselves submerged. Neighboring cities send tools and labor and take on the work of reconditioning machinery until the local shops can function.

It has all happened before. They know just what to do. It probably will happen again—to our reproach. But it leaves a proud record for these electrical men. The job done by these unsung heroes of the flood is an inspiration to the industry.

Atlanta— A Good Idea

For the past two years electrical development in the Southeastern states has been booming. Just how much T.V.A. has had to do with it, is hard to say. But we do know that when King Franklin turned on the heat, things started hopping. Unpleasant as it may be, there is nothing like the hot breath of the wolf on the back of your neck to make you step—and think.

So the power companies have been going great guns in the Carolinas, Georgia, Alabama, Florida, Tennessee. The use of electricity in domestic, commercial and industrial service has been expanding and increasing as it never did before. Everybody is busy. It is an amazing record of accomplishment, under most difficult conditions, but it has put electrical men on their toes. There are things to be learned today in the Southeast.

There are plenty of reasons, therefore, why it will be worth going to Atlanta to attend the Southeastern Industry Conference on March 15 and 16. And there is good hope that it will bring much benefit. The meeting was initiated by NECA as a point conference of all

branches of the industry, a practical step toward spreading the influence of this spirit that now fires this section.

The purpose is not to discuss differences, but to bury controversy and to coordinate objectives. The vital thing to all electrical men is their common opportunity to prosper together by creating a broader market. In this market it is but incidental that we are contractors, wholesalers, manufacturers or utility men. The main thing is that we are a working team—with bigger work to do. Earl Peak has called the meeting. Let's go.

Bonding Licensed Contractors

Buffalo recently nullified the bonding requirement of its electrical ordinance. It was shown that no claims had arisen in that city over a period of ten years, although more than 100 licensed electrical contractors had been paying a \$20 premium each year for a \$2,000 bond. This sum in addition to the annual license fees.

Since this now defunct requirement aimed to enforce the observance of ordinances in the public interest, this question arises—Did a \$2,000 contractor bond protect the public from being poached upon by desperate chisellers during the depression? Were the qualified contractors of that city protected against incapable, unethical and cut-throat newcomers during those last few years?

When a group of electrical contractors by their own efforts cause bonding to be dropped, it would invite sober thinking on a moot question. It may be that bonding of this type is practical and worth the price.

Not "Old Stuff" —And Important

During the early days of contracting, the installation of bells and other signaling systems was no small activity. Much of this work was done before the use of electricity for light or power had become general. Gas was still the popular illuminant, and elaborate wiring systems were devised by our pioneer electricians for lighting gas fixtures by remote control.

For over 35 years the contractor's work has been expanding into other fields of wiring. And his absorption in lighting, power and control problems has to a degree diverted his attention from the more ingenious devices now used for inter-communication, announcing, paging, sounding alarms and the like. And yet all of these new devices and their systems are based upon fundamental electrical principles. They have grown out of the activities of the pioneers, who labored in

designing the crude lighting systems of the nineties. These wiring systems also render a service vital to modern life, and they present a field rich in opportunities for development.

It is the tendency of modern contractors to specialize on light and power. And this is well. It is also natural that factory electrical forces should concentrate upon the more complicated problems of the heavier circuits. But, after all, our responsibility should embrace everything that electricity can contribute to operations and to service. And this means that every profitable use of signalling and communication should be thought of and applied.

It is with this idea of giving practical aid in this direction that a new department—Questions on Signaling and Communication—appears in this issue. We hope it will help to keep our readers abreast of the changing technique of this field, and to further the interest and ingenuity of those who must design, install and service these systems. It is not "old stuff." And it's important.

Do The Job In Your Own Town

More than five hundred small frame houses have been contracted for in the program recently launched by the National Lumber Manufacturers Association. Some three thousand will be built to demonstrate how comfortably and attractively the small low priced dwelling can be made and how easily it may be financed.

It is a sound idea. The concrete people should step out with three thousand more and the brick industry with a like number. Why they have not added their strength to this creative impulse is hard to understand. Maybe they will.

But anyway electrical men can help carry this program forward by local cooperative action. In every city the contractor should sit down this month with the builders, architects, the material people, the "real estate" and the bankers, and launch demonstration houses there. No town need wait. The opportunity is everywhere.

If these cottages are well planned and built and easy to buy and varied in design and scattered about town, they will sell. And if they are built in groups they will offer wiring contracts worth having and a profitable business.



Questions ON THE CODE

Answered by F. N. M. SQUIRES

Chief Inspector New York Board of Fire Underwriters

Cable Touching Copper Pipe

Q. Please advise me as to whether or not there is any restriction in the National Electric Code or later amendments, prohibiting armored cable being near or in contact with copper water lines in residences.—H.O.C.

A. There is no rule in the National Electric Code which states that armored cable must not be in contact with copper water pipe. However, rules 505-a and b indicate that armored cable should be kept dry unless it is of the lead covered type. (Type A.C.L.)

Inspectors have quite generally required that armored cable run over rather than under cold water pipes because of the water dripping from the water pipes when the air surrounding the pipes is warmer than the water in the pipes. As the top of the pipes is also wet the cable should not touch the pipe even if it is run over the pipe.

The question is probably raised because of the probability of corrosion due to electrolysis from the steel of the cable and the copper water pipe being in contact in the presence of moisture. Undoubtedly such an action would result and therefore, the cable and the water pipes should be kept separate.

Application of the Code

Q. Can the local inspector take recommendations of the Code and turn them into requirements? W. R.

A. In general local inspectors should apply the Code rules as written and any deviations from the rules should be made only by the inspector's headquarters. But in many localities and especially with governmental inspection bureaus, the inspection bureau under its controlling

ordinance has the power to make the rules and, therefore, has the power to modify the rules.

Also not all inspection departments adopt the National Electrical Code as a whole but adopt only such portions as they desire and then modify the rest to suit their own needs. The contractor must find out for any particular job just by what rules he is governed and then must abide by them. If for instance, he is working in a State which has a State Code he must comply with that Code and no inspector of that State would have the power to change any rule. Only the designated authority of that State would have such powers.

A Correction: Bends in Conduit

Attention has been called, and very rightfully so, to an error in a Code, item which appeared in the July 1936 issue. The article indi-

cated that a quarter bend was one of 45 deg. Of course that is wrong as a quarter bend is the same as a right angle bend which is one of 90 deg.

The fourth paragraph of our answer to the question on "Number of Permissible Bends" in the July issue should have read,—“By the equivalent of two quarter bends is meant that there shall not be a bending of the conduit from fitting to fitting to exceed 180 deg. This might be two right angle or quarter (90 deg.) bends or six 30 deg., or three 60 deg. bends or any combination of any degree of angle bends which does not total more than 180 deg.”

We beg pardon and thank our two correspondents who wrote regarding this. (But why did it take six months to uncover this?)

C.N.X. Cable

Q. There is one matter for which I would be pleased to hear whatever comments you might wish to make. For some reason or other I find no information in this office regarding type C.N.X. cable.

I understand that this is approved by the Underwriters' Laboratories for trial installation in certain types of buildings.

If this is a bare neutral cable, it does bring up the question of outlets, junction boxes, switch boxes, etc., and also as to what type of buildings the installation is to be allowed in. Any information you might send me would certainly be appreciated.—S.J.H.

A. We thank our correspondent for submitting this question and for the opportunity for answering it as there is considerable confusion regarding this material.

The initials given as a caption is the term of a type of cable made by one or more wire manufacturers for use only on trial installation under controlled conditions. There are other "Trial Installation Cable" not under the trade name C.N.X., made by other manufacturers for this same purpose. These cables are listed by Underwriters' Laboratories in their "List of Inspected Electrical Appliances" on page 253 of the May 1936 issue and on page 50 of their November 1936 Supplement.

As this is of such great importance at this time, principally because of attempts to use this cable for general installations that we are quoting below from the above mentioned publication.

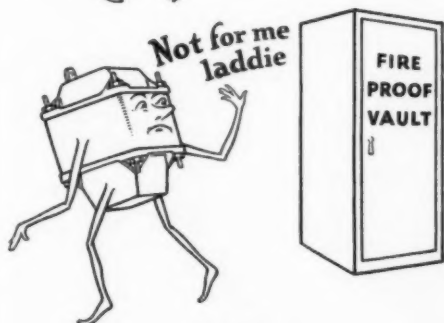
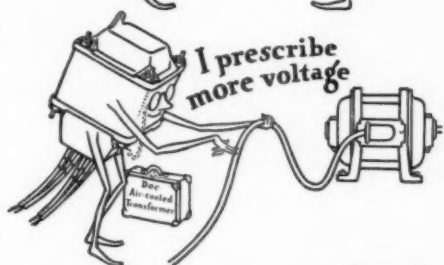
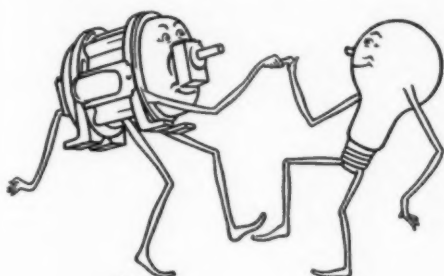
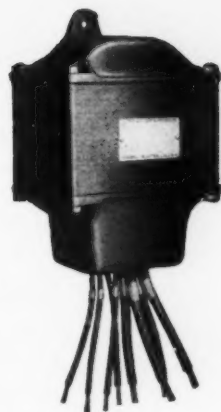


MAY GET NEW CODE—Cleveland's new city electrical code which has been hanging fire so long looks promising now, says A. J. Pickett, city electrician. Public hearings were begun in January, after a committee representing local industries, building and apartment owners and managers, architects and engineers, and the electrical industry, have worked since November 1934 on revisions of an earlier draft. Cleveland's present code dates back to 1910, except for amendments made when the local building code was amended in 1927.

Savings for Your Customer Mean PROFITS for You

SHOW your customer how he can save money or increase plant efficiency with new equipment—and a sale and its profit are practically made.

Look over these money-saving applications of G-E air-cooled transformers and see how easy it would be to show your customer substantial savings—and gain profits for yourself.



1. Combine lighting and power circuits—step down from the power circuit for lighting or small power load at the point of use. Use of this arrangement, where permissible, cuts lighting costs.

2. Increase plant capacity quickly and inexpensively by stepping up voltage in the plant distribution system—where insulation strength permits—and stepping down at the point of use with G-E air-cooled transformers. This relieves overloaded feeders—saves expense of new heavier circuits.

3. Save the expense of fireproof vaults by installing G-E air-cooled transformers for applications of 600 volts and below instead of conventional oil-filled transformers.

Industrial plants will welcome the savings that can be made by installing G-E air-cooled transformers. Ask for complete information, and cash in on this profitable business. General Electric, Schenectady, N. Y.



GENERAL ELECTRIC

Electrical Contracting, March 1937

General Electric Company, Department 6 -201
Schenectady, N. Y.

Please send me a copy of your Bulletin GEA-897F, "Air-cooled Transformers for Lighting and Power Service."

Name.....

Company.....

Address.....

330-86



Here is the FASTEST-CUTTING CONCRETE DRILL you ever saw!

KWI-KUT is an improved type of Concrete Drill so constructed that it cuts around the circumference of the hole—expels chips automatically—cannot wedge or bind—and consequently is about **50% faster than the ordinary drill.**

KWI-KUT needs less rotating than other drills, is made of fine tool steel accurately tempered, and because of its special shape is easier to sharpen. Any good mechanic can save the price of a drill in two hours work, or less. Write for complete story.

'KWI-KUT'
CONCRETE DRILLS
Patent Applied For

KRAEUTER & CO.
(Pronounced KROY-TER)
NEWARK, N. J.

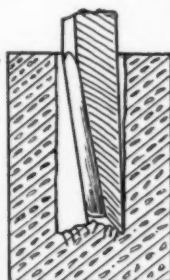
Manufacturers of Highest Quality Pliers
and Tools Since 1860
"Ask Any Mechanic"



KWI-KUT CUTS ON
CIRCUMFERENCE ONLY.
DRILLS ROUND HOLE.



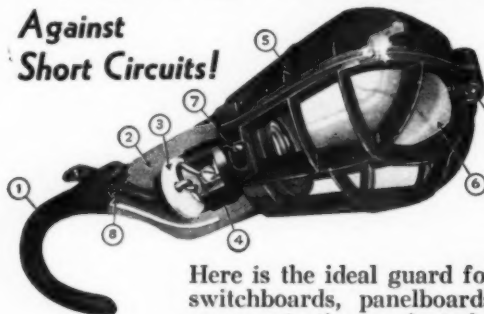
KWI-KUT BREAKS OUT
CENTER PORTION.
DOES NOT WEDGE.



Here's how the KWI-KUT Concrete Drill cuts on the circumference, breaking out the center portion.

PROTECTION

Against
Short Circuits!



McGILL
Portable
Lamp Guard
No. 999

Here is the ideal guard for use around switchboards, panelboards and wherever protection against short circuiting is vital.

- 1—Hard, molded rubber hook with steel core.
- 2—Pliable, molded rubber vulcanized to rubber hook.
- 3—Heavy fibre disk resting on solid rubber ledge to hold wires—knotted for relieving pull and strain on socket connections.
- 4—Special McGILL 660-watt, weatherproof Levolver socket.
- 5—Short-proof, spark-proof, molded Insurok cage.
- 6—Built-in reflector.
- 7—Countersunk screws at end and at base.
- 8—Symbol of Underwriters' Laboratories.

ORDER FROM YOUR WHOLESALE

McGILL MANUFACTURING COMPANY

World's Largest Lamp Guard Manufacturers

VALPARAISO, IND.

Box No. 670

Questions ON THE CODE

[FROM PAGE 74]

reasonably consent to further development in the field of a reasonably limited number of installations when made under controlled conditions and when the following provisions are observed.

1. Limit to alternating current supply.
2. Limit to a voltage to ground not to exceed 150 volts.
3. Limit to systems where the neutral conductor can be grounded at the service switch to an electrically continuous metallic underground water piping system.
4. Limit installation in accordance with one or more of the following sections: 503, 504, 505, 506, 507, 508, 510, 511, new 512 and other approved assemblies.
5. If a metal system encloses the conductors of a circuit, provide for its continuity, as by bonding jumpers or equivalent.
6. Provide for the continuity of the neutral conductor by prohibiting any switch or fuse and by bonding or equivalent at all junction boxes, etc.

7. Permit only for fixed wiring up to the final outlet; and require insulated conductors beyond this final outlet.

8. Require a metal enclosing system to be bonded to all foreign metal systems with which it may make casual contact, such as piping, ducts, frame-work, etc.

9. Prohibit the use of bare neutral wiring systems as extensions of existing insulated wiring systems.

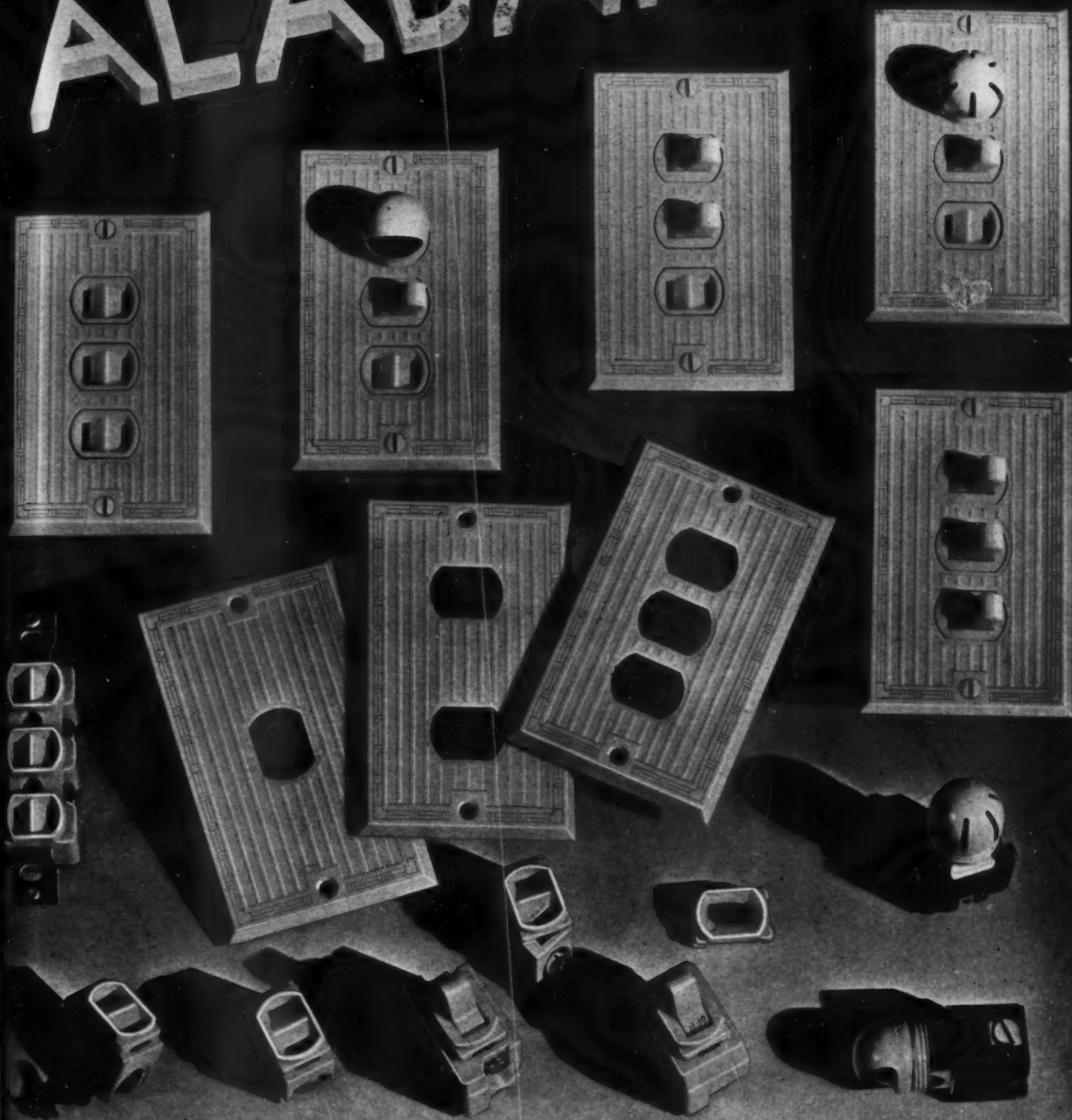
10. Prohibit the use of bare neutral wiring systems in hazardous locations as defined in Article 32.

"The term 'other approved assemblies' in sub-paragraph 4 of the res—"Trial Installation Cable for Interior Wiring Systems.

"At its annual meeting, May, 1935, the National Fire Protection Association approved the report of the Electrical Committee including a revision of the resolution on Trial Installations of Inside Wiring Systems with Bare Grounded Conductors accepted in 1934. As revised the Resolution is as follows:

"It is the sense of the meeting, in view of the findings of the Special Committee on Bare Neutral in Interior Wiring Systems, that regulatory bodies, in order that further field experience can be gained and so that the Committee on Article 5 may have practical guidance, may

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MODERN AS TO-MORROW—
ECONOMICAL TO INSTALL

Alabar (Ivory) Wiring Devices can be found in America's finest homes—their ultra-smart design fits in perfectly with today's trend toward modern decoration.

And remember—the economies effected by multi-gangging of devices to permit their installation in a single-gang box brings the installed cost down surprisingly low.

The P&S-Despard Line is sold through your electrical wholesaler.

PASS & SEYMOUR, Inc.
Syracuse, N. Y.

P&S-DESPARD WIRING DEVICES



BETTER INSTALLATIONS With the "35 Line" APPLETON UNILETS



Benefit by the convenience and ease of installation with Appleton "35 Line" Unilets. The rounded ends of the cover opening and the absence of ear lugs give you more wiring space, and save time and money.

The castings for Appleton Unilets are made in the Appleton Foundry under careful supervision. They are made of malleable iron—giving both strength and lightness in weight. The cadmium finish provides positive resistance to rust and corrosion. Write for further information.

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APPLETON

Threaded and No-Thread Malleable

Standard for Better Wiring

UNILETS

Questions ON THE CODE

[FROM PAGE 76]

olution as above contemplated consideration, after examination and test by the Laboratories, of the merits of any proposed new conductor assembly and associated devices and the publication of a report and also of a listing card appropriately marked to identify the trial status of the product.

"The following special and temporary listing covers cables developed as a result of the action of the Electrical Committee and the National Fire Protection Association."

It should be particularly noted that the above resolution states, in part, that "... regulatory bodies (inspection bureaus) ... may reasonably consent to, etc. ..." which means that before installations of this type of bare neutral (or trial installation cable) are made on any job the contractor should request special permission from the inspection department.

If special permission is granted to make trial installations, then all ten of the special provisions listed above must be carefully observed. Note the requirements for grounding and particularly for bonding, and that its use is severely restricted to only those localities where "an electrically continuous metallic underground water piping system" is present and available for grounding.



WHO'S WHO—H. P. Sell, genial superintendent of construction for the H. N. Crowder Jr. Co., of Allentown and Easton, Pa., has an accumulation of industrial and institutional job photographs which reads like a "Who's Who in Industry" for that trade territory. Silk mills, railroad terminals, cement plants, and many other industries of New Jersey and Pennsylvania have been equipped by this company.

Electrical Contracting, March 1937

I'VE JUST SIGNED THE FAN AGREEMENT!



Yes, sir! I've been signing the G-E Fan Agreement for more than thirty years now . . . and I'm proud and happy to sign again for 1937.

Maybe, you wonder why? Well, here's the reason.

The General Electric Company has always given me an *outstanding* line of fans. This year, the line looks better than ever!

They've always *helped me to sell* G-E Fans, with free displays . . . catalogs . . . folders . . . and newspaper advertising. This year they've got the sweetest set-up I've ever seen! And, they've always had a *liberal guarantee*, which protects my fan profits!

That's why, when Jones stopped in and showed me that new G-E portfolio, FAN PROFITS ARE IN THE BAG,* I just said,

"Amen, brother," and I signed right on the dotted line.

Yes, sir! The G-E Fan crowd has always treated me right . . . and they're going to get my fan business as long as they do!

*** WATCH FOR
 THE MAN WHO
 CARRIES THIS
 PORTFOLIO. HE
 WILL SHOW YOU
 HOW YOU, TOO,
 WILL PROFIT
 WITH G-E FANS.**



GENERAL ELECTRIC

FANS

APPLIANCE AND MERCHANDISE DEPARTMENT, GENERAL ELECTRIC COMPANY, BRIDGEPORT, CONNECTICUT

Questions on SIGNALLING and COMMUNICATION

Answered by ALBERT A. SCHUHLER

Addition to Small Inter-Phone System

Q. It is contemplated to add a third telephone to a present two-wire pair-phone system. The present system has two wires running between the two instruments. Two dry cells are used at each telephone.

Will you advise how the third or extension telephone may be connected?

—R.H.L.

A. A private line or pair-phone system is designed primarily for only two telephones, that is, for calling and conversing with a person at the opposite end. While a third telephone may be added it seldom gives very satisfactory service.

To connect the third telephone, extend the two line wires directly from the main pair of wires to the extension telephone, or in multiple with them. The extension telephone will require its own source of current, usually two dry cells. In connecting these dry cells care should be taken for proper polarity connections, otherwise the "talking" will be found to be very weak.

Under the best conditions the extension telephone will be somewhat lacking in volume. An extra dry cell added to the original two dry cells at the extension telephone often improves this condition, however.

Machine Operators Call System

Q. I have a problem in our plant, to install a signal system which will enable the operator of a machine to call a foreman in the event of a break-down, or to check certain production operations.

We want to operate a switch at a station located adjacent to a number of machines, and have a lamp illuminate on the station making the call; also to have a corresponding lamp illuminate in an annunciator in the foreman's office, to indicate origin of call. In addition, we must provide an audible



Albert A. Schuhler

signal within this annunciator in order to attract the attention of the foreman more readily, and at the same time make it possible to repeat the audible signal as desired. The annunciator should be equipped with a cut-off switch for disconnecting the audible signal. How can this be set up? P.S.M.

A. THE station used is generally known as a ward type nurses call station of the tumbler model. In appearance the switch resembles a lighting tumbler switch. In operation it

Advice On Signal Problems

In this department we begin this month a new service to our readers—practical advice on everyday problems encountered in installing and maintaining signal and communication systems. Albert A. Schuhler, the well known authority in this field, will answer questions and endeavor to be helpful.

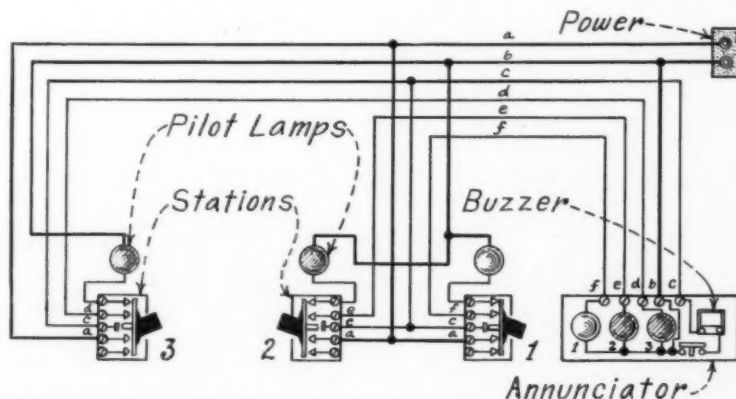
Mr. Schuhler knows this field. He was four years an estimator for contractors in New York, five years electrical instructor in the Ranken School of Mechanical Trades, St. Louis; two years with the Army Signal Corps; five years with Terrell Croft Engineering Co., University City, Mo.; seven years with Holtzer-Cabot Electric Co.; two years with Connecticut Telephone & Electric Company, Meriden; and five years chief sales engineer with Stanley & Patterson, Inc.

Meanwhile, he has acted as a consultant in signal system problems. He collaborated with Terrell Croft in four hand books on wiring. He is the author of "Electric Wiring," now published by McGraw-Hill Book Co.

Here then is thirty years of practical experience, gained in all fields of wiring in all parts of the country, now available to you. Mr. Schuhler will welcome letters of inquiry addressed in care of Electrical Contracting, New York.

differs considerably from a lighting switch, inasmuch as it has four spring contacts which operate the lighting circuits, and one used to operate an audible signal circuit.

After the lever of the tumbler switch is drawn downward, the lighting circuits are closed continuously. As the lever is drawn downward to the fullest degree, the audible signal circuit is closed momentarily. When the hand is



LIGHT AND SOUND—Wiring plan for connecting machine operators call system.

HAZARD

WIRES and CABLES

HAZARD FIREKROME SAFECOTE BUILDING WIRE

Performite Super-Aging Rubber Insulation—the highest type of building wire. Performite rubber is tougher and stronger than any in common use heretofore. It has greater life, making it preferable for monumental buildings, public institutions and high class residences.

Hazard Standard 30% Insulation—an excellent grade of wire which has been used in many of this country's outstanding buildings.

Hazacode—National Electrical Code Standard. Complies with all the requirements of the National Board of Fire Underwriters.

All Hazard Building Wires have the well known "SAFECOTE" finish—moisture-resistant and flame-retardant.

HAZARD ALL-RUBBER PORTABLE CORDS AND CABLES

with tough 60% rubber jacket vulcanized in metal molds.

Hazard Portable Cords are furnished in sizes No. 10 and smaller, for electrical tools, trouble lamps, etc., and in cables, sizes No. 8 and larger, for mining machines, electric locomotives, electric shovels, etc.

Hazard Welding Cables are made with super-flexible conductors and provide the utmost flexibility, combined with toughness and abrasion-resistance.

Hazaprene is similar to the regular Hazacord with a 60% rubber jacket except that it has an outer jacket compounded with Neoprene, the well-known synthetic rubber product of the DuPont Company, which enables it to resist the destructive effect of oil and gasoline.

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LINE TO
MEET
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● Steelduct conduit is recognized for its easy bending and easy wire-pulling qualities. All rigid conduit is thread protected to insure perfect threads when delivered. On your next job use STEELDUCT conduit and save on installation costs.

A complete line of rigid steel conduit

ELECTRO-GALVANIZED RIGID CONDUIT

HOT-DIP GALVANIZED RIGID CONDUIT

BLACK ENAMELED CONDUIT

AND

**ELECTRICAL METALLIC
TUBING**

The **STEELDUCT** *Company*
YOUNGSTOWN · OHIO

Questions on
**SIGNALLING and
COMMUNICATION**

[FROM PAGE 80]

removed from the lever the audible signal circuit is opened, but the lighting circuits remain closed until the lever is returned to its original position.

Push button stations of the magnetic type may be used on the same voltages as the tumbler type, namely, 12, 24 or



DOUBLE DUTY—Calling station with switch and bullseye, adaptable to many uses.

110. The locking type, however, may only be used on 12 or 24 volts.

In case it is desired to separate the pilot light from the switch, the stations would again be located adjacent to the machines. The pilot light, preferably of the dome type, would be located on the ceiling or on the wall, seen from several directions.

The circuit of this system is shown in the sketch. In general, the wiring consists of two battery or feeder wires, a and b, leading to all stations, one of which, b, supplies current to one side of all lamps. The other wire, a, supplies current to the stations. In addition there would be one common buzzer wire, c, leading from every station to the buzzer. Finally, one section, wire, d,e,f, is carried from each station to its annunciator lamp.

An extension buzzer or bell may be added by simply connecting across the wires b and c. Such audible signals are often desired in noisy locations.

Annunciators with Lever Switches

Q. We recently decided to add a second gravity hand reset annunciator to a present annunciator system,

Electrical Contracting, March 1937



PANELBOARDS — "The Sign of a Better Job"



NEW SERVICE EQUIPMENT

PULL FUSE SWITCH TYPE



for

New Sequence Meter Connections

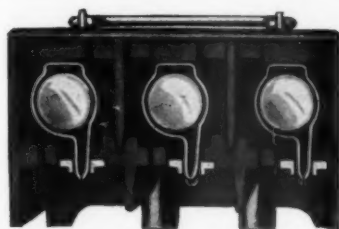
Illustrated above is one of the FA dead-front, safety-type assemblies—designed for new sequence meter connection—and equipped with the NEW FA PULFUZSW Units, the advantages of which are illustrated and described at the left.

This new service equipment can be furnished in 30 and 60 ampere capacities—single and double pole—from 2 to 8 circuits, with range feeder circuit—or 2 to 12 circuits, without range feeder circuit...

Designed for 115/230 volt alternating current feeder systems—neutral connections bonded.

For direct current service, neutral will be furnished insulated.

Easy to make a neat workmanlike installation—occupies minimum space.



Cross section of FA PULFUZSW Unit showing positive clamping contact between silver-plated switch blade fuse clamps and switch contact slots.

FA PULFUZSW UNITS *Electrical, Mechanical, and Operating Features*

High-pressure switch contacts and low-resistance, large area fuse clamp contacts.

All current-carrying parts are substantial and heavily silver plated to assure long life and high conductivity.

Fuses slide "easily" and quickly into place... No tools necessary.

Ample ventilation prevents over heating.

Visible "ON" and "OFF" indicator.

Terminals for bus or cable connections are integral with switch contact slots. Bakelite barriers in fuse clamp holders isolate each fuse in an individual compartment, preventing possible short circuits.

Quick, positive operation... To throw circuit from "ON" to "OFF" position pull out fuse carrier—turn 180°—and re-insert into base... Bakelite base and fuse carrier—light but strong.



THIS NEW CATALOG WILL HELP YOU GET MORE BUSINESS

The New FA Catalog No. 56 has just been published. ... It is a valuable, business-getting "handbook" for Electrical Contractors... Contains complete engineering, reference and pricing data on the entire FA line of quality products... Send for copy.

Frank Adam
ELECTRIC COMPANY
ST. LOUIS

"Latrobe"
FLOOR BOXES

— and your
**ELECTRICAL
WHOLESALE —**
a perfect combination!



**NO. 300 "LATROBE"
MIDGET FLOOR RECEPTACLE
AND BOX**

The only non-watertight floor receptacle and box on the market approved by the Underwriters laboratories for installation in wood floors.



**NO. 480 "BULL DOG" ARMORED
CABLE SUPPORT**

A new, lightweight, strong clamp for supporting or hanging cable to steel framework. Permits hanging from any angle. Best and most economical way of temporarily or permanently installing armored cable in buildings of steel construction.

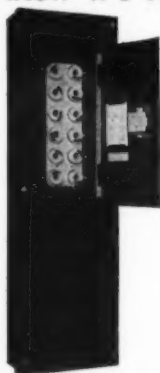
**to save time
... save money
... save labor**

The FULLMAN reputation for Quality is back of this complete line of floor boxes for every application. Your Electrical Wholesaler can supply you . . . Catalogs and Price lists will be sent promptly upon application.

**FULLMAN MFG. CO.
LATROBE PENN.**

MANUFACTURERS OF QUALITY FLOOR BOXES AND WIRING SPECIALTIES

You Know It's Right*



*You'll save both time and money if you use products that are *right* from the start. Walker products are *right* in design and construction, *right* for economy and *right* for ease of installation. Because of our own twenty-five years of successful contracting experience we make them that way.

For example: the panel illustrated, made of rust-proofed steel with baked-on enamel finish, will help you do a better job of wiring with as much ease, economy, and satisfaction as you ever hoped for.

Let us tell you why.
Write today.

**WALKER ELECTRICAL CO.
ATLANTA, GA.**

A LITTLE FELLOW*



MINERALLAC JIFFY CLIP

One size smaller than the
 $\frac{1}{8}$ inch Pipe Jiffy.

*** The No. 375
In Cadmium Plated Steel,
Everdur and Aluminum**

Ask your Jobber

**New York City Office
Theodore B. Dally
50 Church Street**

MINERALLAC ELECTRIC CO.

**25 N. Peoria St.,
CHICAGO, ILL.**

*Questions on
SIGNALLING and
COMMUNICATION*

[FROM PAGE 82]

and have it so arranged that it may be connected or disconnected, and operated alternately with the original annunciator. In order to do this we extended the button section wires to the new annunciator, and then used a two-point lever switch to make and break the feeder wires to each annunciator.

With this arrangement we find that several drops operate in both annunciators when one push button is pressed. How is it possible to operate this system as above outlined?—A.M.C.

A. This is a common fault in this type of system. The two-point lever switch does not actually disconnect the wires: This permits current to flow back and forth, in series with the drops in both annunciators. To correct this fault, remove the present two-point lever switch and replace it with a switch which will break every section wire to both annunciators.

Adding Audible Signal to Silent Call

Q. A hospital which for several years has had a silent call nurses call system, now wants to add buzzers to the nurses station lamp annunciator and at the duty room stations.

The wiring has been installed for a number of years, and the conduits are filled to capacity at some points. Another objection to rewiring at this time is that there would be considerable interruption in service to the patients. Is there any way to install these buzzers to give the service required, without pulling in extra wires?—MSW.

A. The addition of buzzers as audible signals in the present signal recording stations may be accomplished quite readily by the following method.

Insert an interrupter or small thermal flasher in these annunciators and duty room stations. The buzzer will operate momentarily and at intervals, just as long as a signal is registered.

In the nurses station annunciator it is necessary to connect the interrupter in series with the buzzer. Then connect this combination between the feeder binding screw of the annunciator and the feeder wire itself.

In the duty room station the interrupter and the buzzer are again connected in series. But this time, this combination is connected in multiple, with the pilot lamp in the station.



No Sales Picture is Complete without

PANTHER and DRAGON TAPES

HAZARD INSULATED WIRE WORKS

Division of

THE OKONITE COMPANY

Factories: Wilkes-Barre, Pa. Passaic, N. J.

A PROTECTION *that's* TRUSTWORTHY



GALVAKOTE ENAMELKOTE ELECTRICTUBE HOTKOTE

• The rigid inspection that these brands passes assures protective, lasting finish. The hard, yet elastic zinc and enamel coverings will not chip, peel or flake or bubble. These finishes stay "put" and last indefinitely after installation.

It is forethought and good judgment to purchase Galvakote, Enamelkote, Hotkote or ElectRICTUBE. Install this line of conduit with the knowledge that the wires they hold will have permanent protection.

**CLAYTON MARK
& CO.**

Opera Bldg.
Chicago, U.S.A.

Low Tension Wiring Design

[CONTINUED
(FROM PAGE 21)]

of manufactures, there are naturally some slight differences in current consumption and the amount of power taken. Therefore, in considering these differences, the averages selected tend toward the higher values.

The first column lists the type of signals. Columns 2, 3, 4 & 5 give the current values in amperes, at specified voltages and currents. Columns 6, 7, 8 & 9 show the amount of power required for each device at specified voltages and currents.

All bells and buzzers considered here are of the contact type, except those specifically noted as polarized, solenoid, single stroke, or chimes. The vibrating horns are understood to be of the contact type, for operation on d.c. and of the non-contact type for operation on a.c.

Tables 2 and 3 give wire sizes for 12 and 24-volt systems. Column 1, in each table, indicates the length of the circuits. The wire sizes, in B&S gauge, are shown in the columns designating load in amperes. The lengths of the circuits are figured in the lineal, or one way distance.

While these tables, perhaps, are more accurate on lines where the loads are concentrated near the ends of the circuits, they may also be used to calculate the sizes of wires in circuits where there are considerable distances between signal units. In the latter case, the loads may be calculated individually for greater accuracy. This may allow a reduction in wire sizes for outlying portions of circuits. Dividing the load into smaller circuits will also permit reducing wire sizes. In general, however, the wires sizes shown will result in the highest obtainable efficiency for the operation of a system.

Wire Selection

To determine wire sizes the following procedure may be adopted—

1. Determine the load in amperes, which will be operated simultaneously.
2. Find the lineal distance from the control center to the last unit in the circuit.
3. Decide what voltage drop is allowable in accordance with the manufacturers recommendation.
4. Determine the wire size that will not exceed the voltage drop recommended.

In using Tables 1 and 2, or 1 and 3, all of the above values may be found,

for usual types of apparatus. As an example: A system consists of 10 polarized non-contact vibrating bells, 8 inch in size, to operate on 24 volts, 60 cycle a.c. The length of the circuit is 300 feet. The voltage drop is 25 per cent, which is allowed for in the table.

The wire size may, be selected by checking columns 1 and 3 of Table 1, which shows that this bell consumes approximately .15 amperes. Multiplying this value by the number of bells, 10, we have a total of 1.5 amperes. Checking columns 1 and 3 of Table 3, we take the next higher current value, which is 2 amperes, and this selection indicates that No. 16 B & S gauge wire should be used.

Although the tables show wire sizes as low as No. 18 B & S gauge, it is suggested that nothing smaller than No. 16 wire be used. The extra tensile strength of this gauge wire is very desirable, however, especially where used in conduit installations.

Load Covers

Signaling circuits having individual control of the various units, as is the case of selective call systems, annunciator systems and program systems, require that the "section" wires be only sufficiently large to carry their own individual load. The size of the common wire depends upon the type of system. Should only one signal be operated at one time, for example, then this wire need only carry the load of the one unit. On the other hand, should there be a master or group operation in the same system, the common wire will be required to carry the maximum load.

Interconnection strip cabinets should be installed at frequent intervals, certainly on every floor of a building. They act as distributing centers, allow testing of any circuit, permit circuits to be interconnected, if desired, and make possible the isolation of any circuit which may cause trouble.

Color-coded, rubber covered wires should be used in all signal systems. The identifying braid on the wire eliminates most of the testing ordinarily required with non-color-coded wires. This wire also facilitates making proper connections to the apparatus, and aids in locating trouble in circuits.

Color-coded cable should be used, wherever a number of wires are to be used in a system. Besides having advantages, as outlined above for the individual wires, the cable takes up less space in conduits. For surface work nothing but cable should be considered, as it provides the only means of making a workmanlike installation.

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Keep UP-TO-DATE on new developments through this

WATTHOUR DEMAND METERS

1. Catalog Section 42-315 describing watthour demand meters, application and operation of types RW and RW-2 indicating demand registers and list prices in combination with various types of meters. Outline dimensions and wiring diagrams included for each combination. Westinghouse Electric and Manufacturing Co.

PACKINGS

2. A 112-page manual on applications of industrial packings, including sections on sheet packings, gaskets, rod and plunger packings, hydraulic packings, flax and jute, locomotive and special oil well rotary drilling packings, pump valves and miscellaneous. United States Rubber Products, Inc.

MOTOR BEARINGS

3. A catalog for 1937 electric motor service bearings, with over 200 bearings illustrated and described with specifications. Bulletin EM-7 also has sections on universal bronze cored and solid bars; hexagon bars, lead-base and tin-base babbitt, and general purpose phosphor bronze bearings. Johnson Bronze Company.

ENGINE DRIVEN WELDER

4. Welder specification bulletin No. 318 covering "Shield-Arc SAE" welder, type S-6005, with illustrations, charts and detail. Lincoln Electric Company.

WATTHOUR METER PROTECTORS

5. A 4-page folder describing watthour meter protectors, illustrated with applications, outline dimensions, wiring diagrams and performance characteristics. Also describes construction, applications and connections for protecting meters. Catalog Section 38-175. Westinghouse Electric and Manufacturing Co.

WIRING MATERIAL

6. A 528 page book on wiring material and methods. 44 pages of data on adequate wiring and the G.E. Radial Wiring system, including plans, diagrams, specifications, check list and sales data on domestic, commercial and industrial wiring, followed by catalog of wiring products. General Electric Supply Corp.

NEW FREE SERVICE

Electrical Contracting brings you the latest literature of leading manufacturers without cost or obligation

CLIP-ON AMMETER

7. A 4-page folder of illustrations and specifications of the dual range clip-on ammeter, to measure loads on motors, transformers, feeders, switches, without shutting down equipment being tested. Ferranti Electric, Inc.

LINESTARTERS

8. Two leaflets, L-20627-A and L-20628-A, describing De-ion combination and non-reversing linestarters. Sizes and ratings, distinctive features and applications described. Westinghouse Electric and Manufacturing Co.

INDICATING METERS

9. A 27-page booklet describing round portable, square and edgewise types of indicating meters. Describes and illustrates construction and use of instruments. Catalog No. 21. Hickok Electrical Instrument Co.

DISTRIBUTION CAPACITORS

10. A 20-page folder giving details, illustrations and charts on pole type distribution capacitors. Bulletin GEA-2494. General Electric Co.

AIR CIRCULATORS

11. A folder describing 1937 line of fans consisting of ceiling, side wall, floor and low bench models. Propellair, Inc.

CIRCUIT BREAKERS

12. An 8-page folder Bulletin GEA-2505 outlining details of type AF-1 circuit breakers for office buildings and industrial circuits. General Electric Co.

DISTRIBUTION TRANSFORMERS

13. Catalog No. 105 on transformers giving illustrations, tables of voltage ratings, accessories and prices. R. E. Uptegraff Manufacturing Co.

VENTILATING EQUIPMENT

14. A 32-page book of various types of fans, showing illustrations and descriptions of how various representative establishments have solved their summer cooling problems. Kisco Company, Inc.

COMMUNICATION SYSTEMS

15. Bulletins 18, 19 and 20 covering details of microphones, intercommunication with Privaphone and Vocaphone for inter-office communication. Miles Reproducer Co., Inc.

SWITCHBOARD

16. Bulletin GEA-2253A, illustrating streamlined switchboard with all devices semiflush. Available with control panels, metal-clad gear cubicles, duplex switchboards and hinged panels for close-to-wall mounting. General Electric Company.

NO POSTAGE NEEDED

"Knowledge is power." Know the developments in your field. Circle the numbers of the items you want on reverse side of this card and mail today.

GROUND CLAMP

17. Bulletin No. 3018 describes the Burndy Groundem, type GH clamp. Burndy Engineering Co., Inc.

STANDARDIZED TROUGHS

18. A four page bulletin announces Type I-O-H and S standardized troughs for single and polyphase type S instruments. Palmer Electric and Manufacturing Co.

FUSE LINKS

19. A four page folder describing universal tension type fuse links with charts on time current characteristics, arcing characteristics and coordination chart for correct operation of main and branch circuit fuse links. Porcelain Products, Inc.

FUSELESS SERVICE EQUIPMENT

20. Bulletin No. 145, consisting of 16 pages of details on multi-breaker load centers, featuring fuseless low-cost service equipment for residences, small stores, farm buildings, individual apartments and similar structures. Trumbull Electric Mfg. Co.

DISTRIBUTION TRANSFORMERS

21. Bulletin GEA-2442A, consisting of 8 pages of illustrations and detail on the unit-type distribution transformers, type HBA. General Electric Company.

FACTORY LIGHTING PRACTICE

22. A 36-page handbook entitled "A Manual of Factory Lighting Practice". Contains authoritative, engineering information on practical, easy-to-apply methods of fitting the lighting to seeing requirements of each individual operation in the plant. Discusses practical solutions to 30 common lighting problems in industry, written in plain, non-technical language, with illustrations. Give answers to scores of lighting problems involved in inspection and production operations found in practically any industrial plant. Benjamin Electric Mfg. Co.

HOLE CUTTER

23. A folder describing a Hole Cutter which can drill any size hole 3/4-in. to 6-in. in practically any metal or material. D & D Tool Company.

CAPACITOR TABLE

24. A reference table for calculating necessary capacitor KVA to correct load to desired power-factor. Computes reactive KVA required to raise

power-factor to any desired percentage. Reverse side of table shows amount of current drawn by capacitors and also specifies sizes of switches, to be used with varying sizes of capacitors. Ready reference for engineer, factory superintendent and maintenance manager. Cornell-Dubilier Corp.

SWITCHBOARD WATTHOUR METERS

25. Catalog Section 42-104 describing type OB switchboard watt-hour meters of single phase, polyphase and three element types. Includes applications, description and construction features, performance characteristics, outline dimensions, wiring diagrams, ratings and list prices. Westinghouse Electric and Manufacturing Co.

MULTI-BREAKER

26. Bulletin CA-543A supersedes previous bulletins and price list on the Multi-breaker. Incorporates the 9 to 16 circuit Multi-breaker load centers, for both 3-wire single phase and 3-phase 4-wire services, also panelboard and 1 to 8 circuit Multi-breaker service centers and load centers previously listed. Square D Company.

TESTING OIL EQUIPMENT

27. Bulletin 1132 describing American Tran portable equipment for testing oil, type TS-6, for accurate dielectric-strength measurements of transformer oil in the field. May be employed for testing oils used in circuit breakers, distribution transformers, man-hole transformers and other equipment. American Transformer Co.

REMOTE CONTROL DATA SHEETS

28. Data sheets E3 showing how "Diamond H" remote control switches permit ordinary toggle switches or other devices to control heavy electrical loads at any location without expensive wiring. Hart Manufacturing Co.

ELECTRIC FANS

29. 28-page catalog, No. X-1949, illustrating and describing 1937 line of desk fans, ceiling fans, air circulators, ventilating and exhaust fans. A 4-page catalog, No. X-1950, covering electric Seabreeze fans. A 4-page bulletin, No. X-1925, consisting of 1937 retailer sales helps on electric fans. Emerson Electric Manufacturing Co.

LIGHTING DATA

30. A 200-page book of lighting data for industrial, institutional, commercial and domestic installations, includ-

ing background sales data, table of recommended foot candle and catalog of lighting equipment profusely illustrated. General Electric Supply Corp.

KODEKALL SYSTEM

31. A 4-page folder describing an automatic signaler by which the telephone operator sets the dial on KodeKall to the proper code number, pushes the plunger and automatically signals throughout its entire establishment. Schwarze Electric Company.

SAFETY STARTING SWITCH

32. Catalog No. 7 consisting of 66 pages describing safety starting switches for motor and lighting circuits, service equipment, manual and magnetic motor controllers, master devices and circuit breakers. Hart & Hegeman Division of The Arrow-Hart & Hegeman Electric Co.

CIRCUIT ARRESTERS

33. Catalog Section 38-170 on type LV secondary-circuit arresters, giving detail construction views, wiring diagrams and oscillograms of performance characteristics. Westinghouse Electric and Manufacturing Co.

WIRING STRIP

34. A 4-page folder describing ELL STRIP for show window, cove lighting or lumiline lamp installations. Ellicott Manufacturing Co.

MOTORS AND FANS

35. Catalogs give specifications on exhaust fans with multi-speed controllers for wide application and also on motors. Peerless Electric Co.

MEGOHMMETER

36. Catalog No. 40 gives a description and explanation of the Model DM megohmmeter. Herman H. Sticht & Co.

SINGLE PHASE MOTORS

37. Bulletin 2-1, 8 pp.—Construction features and models available of repulsion start, induction type, brush-lifting, single-phase motors are discussed. Models range from one-eighth to forty hp. Century Electric Co.

MILL TYPE STARTER

38. A new standardized unit for the 5-25 H P Range is described in the Mill Type Starter Bulletin. The Electric Controller & Mfg. Co.

PORTABLE ELEC. TOOLS

39. A complete catalog on Electric Tools shows the newer uses of the portable electric tools. The Black & Decker Mfg. Co.

BUILT UP MICA INSULATIONS

40. Bulletin Number 106 gives complete description of built up forms of this material available. Other type insulations: Untreated Papers, Varnishes, Linen and Silk Tapes, Fibre, Spaghetti Tubing, Cotton Sleeving, and Raw Mica are described in Bulletin 108. Mica Insulator Company.

CIRCOOLATOR

41. A 4-page Bulletin No. 44 illustrating and describing CirCOOLATOR for attic ventilation. Viking Air Conditioning Corp.

ELECTRO-CHIME

42. A 4-page folder describing the electro door chime. Folders are available to the trade for use in sales promotional work. Schwarze Electric Company.

CIRCLE NUMBERS-SIGN-AND MAIL

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...these New Switches
make troughing as
simple as A.B.C.!

Cat. 92
Two Pole

Cat. 94
Three Pole

New Colt Noark Pull-out Troughing Switches

Designed for

- .. Unlimited banking
- .. Quicker Installation
- .. Minimum space requirements
- .. Safer operation

These new Colt-Noark switches are built for quicker, inexpensive installation . . . either as single units, or in troughing set-ups using any number of switches. Two types are available . . . Catalog 92, a two-pole unit, and Catalog 94, a three-pole unit, both 30 amperes. In troughing, they are securely fastened in series by use of simple coupling straps and end walls. They are of the knife blade pull-out type, switching action being obtained by simply opening the auxiliary cover, on the inside of which the blades are located. The main cover operates as a dead front plate and can be locked. Each Unit is furnished with solid neutral and method of grounding. In banking, end walls are removed, leaving plenty of wiring room, with no looping of wires required. These units are the latest profit-producers introduced by Colt-Noark. Send for descriptive envelope stuffers and full information.

COLT'S PATENT FIRE ARMS MFG. CO., ELECTRICAL DIVISION HARTFORD, CONN.
H. B. Squires Co., Pacific Coast Representative

100 Years of Manu-
facturing Experience
is back of every Colt
Built Product

COLT-NOARK

SWITCHES INDUSTRIAL CONTROL EQUIPMENT FUSES

Boston
New York
Chicago
Philadelphia

High Lights IN THE NEWS

TO LEGALIZE CUT-OFFS

Electrical inspectors in the state of Ohio may be empowered to disconnect defective wiring or to order the discontinuance of electrical service whenever dangerous wiring is found. An amendment to accomplish this was recently made to a proposed licensing and inspection bill that is being sponsored by the Ohio Electrical Contractors Association, Inc. The text of this amendment, as approved at a recent general meeting of the association held in Columbus, is as follows:

"Said electrical inspectors shall have the right during reasonable hours to enter any building in the discharge of their official duties, or for the purpose of making any inspection or test of the installation of electrical wiring, electric devices and electric equipment contained therein, and shall have the authority to cause the turning off of all electrical currents and to cut or disconnect in cases of emergency any wire where such electrical currents are dangerous to life or property, or where such wires may interfere with the work of the fire department. The chief electrical inspector or his deputy is hereby empowered to disconnect or order the discontinuance of electrical service to any electric wiring, device and equipment found to be defectively installed or otherwise not in conformity with the provisions of this act until such wiring, devices and equipment and their installation have been made safe as directed by the chief electrical inspector or his deputy."

STRESS PUBLIC LIABILITY

Youngstown contractors have warned the public against dealing with irresponsible electrical contractors in the Youngstown, Ohio, district. They say—on an advertising blotter, which has been widely distributed—

"THE COURTS HOLD THAT YOU ARE LIABLE FOR ACCIDENTS OCCURRING ON YOUR PREMISES. You may avoid this liability while having construction work done by requiring the contractors with whom you engage, to furnish you with certificates of Workmen's Compensation, Public Liability and Property Damage Insurance.

The following electrical contractors of

the Youngstown District are prepared to furnish certificates of insurance and employ only skilled union electricians. They can be depended upon for expert service at reasonable prices."

The names, addresses and telephone numbers of fifteen electrical contractors appear with the message.

JOHN CARMODY HEADS R.E.A.

John M. Carmody has been nominated by President Roosevelt to succeed Morris L. Cooke as administrator of the Rural Electrification Administration. Mr. Carmody has been deputy administrator since last August. He was before that chief engineer of the Civil Works Administration, chairman of the National Bituminous Coal Labor Board, and with the National



JOHN M. CARMODY

Labor Relations Board and the National Mediation Board. Previous to that he was editor of *Factory Management and Maintenance* and before that editor of *Coal Age*, both McGraw-Hill publications.

Mr. Cooke had headed the R.E.A. since it was created in May 1935. His resigna-

tion was announced from the White House with the statement that Mr. Cooke was being released "with the greatest reluctance." He had several times requested that he be relieved of his duties, stating that "the R.E.A. is now a seasoned organization and fully competent to carry on." Mr. Cooke plans an extended trip abroad. Before R.E.A., Mr. Cooke was with the National Resources Board.

Carmody's nomination went to the Senate on February 15. It was promptly confirmed.

MEN BEHIND THE WIRING HANDBOOK

Personnel of the joint Industry Committee set up to publish, promote and maintain the new Handbook of Interior Wiring Design has been announced by NEMA. Nine national organizations are represented—

American Institute of Architects
David B. Crane, S'cy. Buffalo Chapter.
John J. Wade, Buffalo

Artistic Lighting Equipment Ass'n
George Ainsworth, New York City
Kenneth Curtis, Curtis Lighting Inc., Chicago

Edison Electric Institute
P. F. Kauffman, Commonwealth Edison Co., Chicago

E. A. Brand, Niagara Hudson Power Corp., Buffalo

Illuminating Engineering Society
Max Gysi, Brooklyn Edison Co.
R. G. Slauer, Westinghouse Lamp Div., Bloomfield, N. J.

International Association of Electrical Inspectors

F. N. M. Squires, N. Y. Board of Fire Underwriters

R. B. Ward, City Electrical Bureau, Newark, N. J.

J. B. Wilkinson, Fire Insurance Rating Bureau, Milwaukee

National Electrical Contractors Association
Allan Coggeshall, Hatzel & Buehler, New York

Geo. H. McKee, Mount Vernon, N. Y.
National Electrical Manufacturers Association

L. F. Adams, General Elec. Co., Schenectady

Frank Thornton, Jr., Westinghouse Elec. & Mfg. Co., East Pittsburgh

C. A. Bates, Bryant Elec. Co., Bridgeport, Conn.

R. W. E. Moore, National Electric Products Corporation, Pittsburgh

H. J. Mauger, Edison G. E. Appliance Co., Chicago

H. H. Weber, U. S. Rubber Products, Inc., New York

Radio Manufacturers Association
L. C. F. Horle, Consulting Engineer, New York

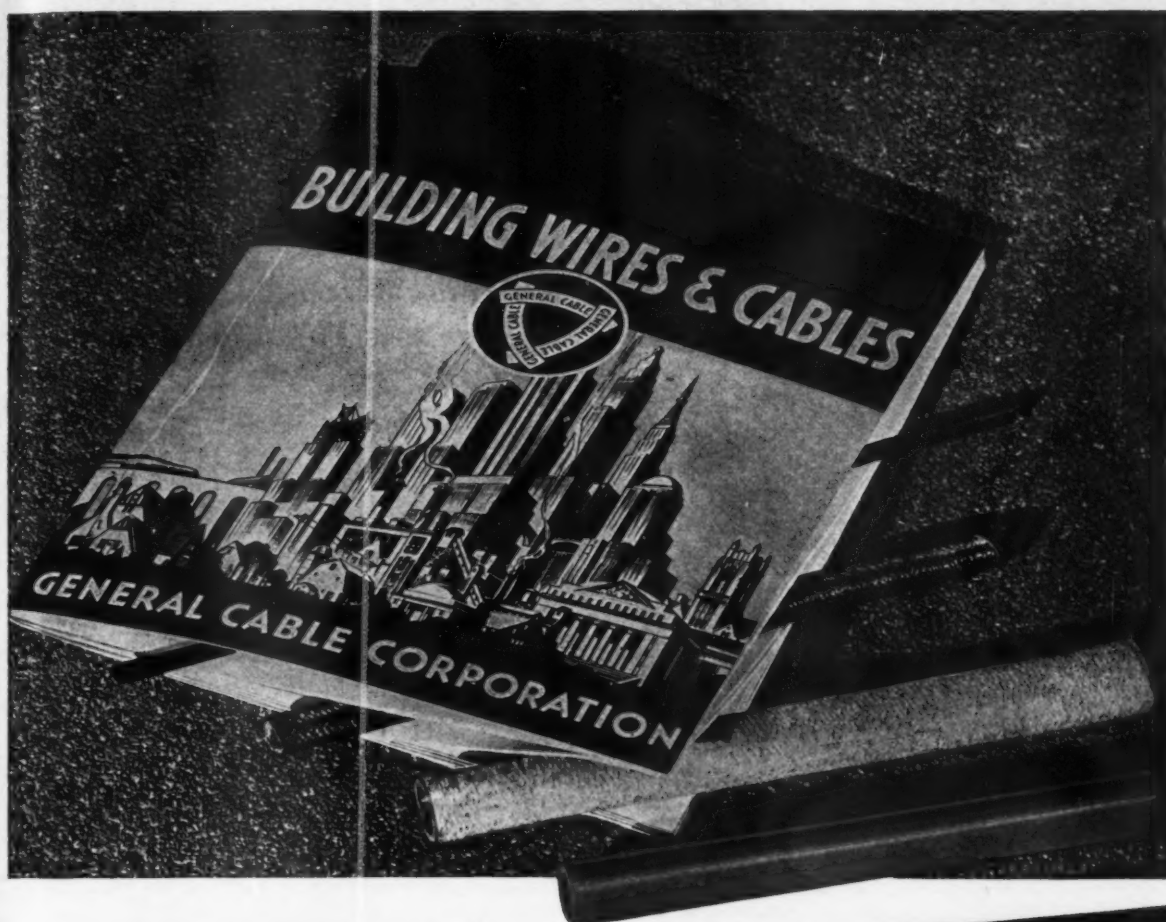
V. M. Graham, Hygrade Sylvania Corp., Emporium, Pa.

National Electrical Wholesalers Association

E. A. Hawkins, Graybar Electric Co., New York.

Electrical Contracting, March 1937

THERE'S A COPY FOR EVERYONE



...AND EVERYONE WILL WANT ONE

An entirely **NEW** and **MORE USEFUL** catalog of **ALL** the wires and cables for residences, factories, hotels, apartment houses, schools, theatres, office buildings, hospitals, municipal, and other types of buildings. New convenience in arrangement, **SIMPLIFIED** tabular data, and quick-reference index. Every man who specifies, plans, purchases or installs electrical wiring should have a copy. **FREE**—for the asking!

Incorporates comprehensive data on: **GUARDIAN BUILDING WIRE—RUBBER INSULATED CABLES FOR HIGHER VOLTAGES—VARNISHED CAMBRIC CABLES—ROMEX NON-METALLIC SHEATHED CABLE—SERVICE ENTRANCE CABLES—AND RELATED TYPES OF WIRES AND CABLES.**

GENERAL CABLE CORPORATION
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Electrical Contracting, March 1937

The technical subcommittee of joint industry committee consists of A. L. Abott, National Electrical Mfrs. Ass'n, New York, O. J. Brady, West Penn Power Co., Pittsburgh, E. A. Brand, Allan Coggeshall, Max Gysi, Brooklyn Edison Company, G. S. Merrill, General Electric Co., Cleveland, R. G. Slauer, Westinghouse Lamp Div., Bloomfield, N. J., W. S. Stewman, New York Power & Light Corporation, Albany, R. B. Ward, City Electrical Bureau, Newark, N. J.

A publicity subcommittee has been set up also to promote the distribution and use of this handbook. It includes: L. W. Davis, National Elec. Contractors Ass'n, New York, C. E. Greenwood, Edison Electric Institute, New York, Herbert Metz, Graybar Electric Co., New York, J. F. O'Brien, Westinghouse Lamp Division, New York, F. A. Parnell, General Electric Co., Bridgeport, Conn., O. C. Small, National Electrical Manufacturers Ass'n, New York, E. A. Brand and R. G. Slauer.

The Handbook of Interior Wiring Design will be available in single copies or quantities from the headquarters of the co-operating associations, on and after February 23, 1937. Prices will range from \$1.00 for up to four copies, to 20c. for 500 or more. The handbook will consist of 80 pages, 8½ by 11 inches in size, profusely illustrated with halftones, drawings and tabular material.

SOLVES D.C. MOTOR PROBLEMS

Practical suggestions for locating puzzling breakdowns in d.c. armatures and coils are given liberal treatment in the book "Connecting And Testing Direct Current Machines" by F. A. Annett and A. C. Roe.



PICKER OF PULCHRITUDE—When in doubt as to the whereabouts of a Chicago contractor, try association headquarters. This picture of Walter Collins and his charming staff makes further comment unnecessary. Just in case you don't know him, J. Walter Collins is secretary of the Electrical Contractors Association, secretary and treasurer of the Electrical Insurance Trustees and runs an unemployment relief plan for Chicago's electrical workers. Walter says two more of his prize exhibits of youth and beauty were absent that morning with the flu, but this is, perhaps, a record staff for any association office in the country—and does Walter know how to pick 'em!

Appearing as a second edition, of a work first published eleven years ago, there are six new chapters that supplement the basic material of the original text, now also revised in up-to-date form.

The new chapters include the work of NEMA in classifying armature and field coils according to their insulation. Improved insulating materials have warranted a chapter on increased machine ratings. Three chapters deal with test methods, including testing of lap-wound armatures with equalizer connections, methods of applying high-frequency voltage to coils or groups of coils, and insulation resistance measurements.

As now arranged, this book is in two parts; one dealing with reconnecting d.c. machines for changes in voltage, speed, or both; the other, on locating and remedying faults in d.c. machines. This second section not only shows how tests are made, but gives the reasons why the tests are made in the way they are. The results of such tests are carefully explained and shown on diagrams of standard windings.

"Connecting and Testing Direct Current Machines," (Second Edition), F. A. Annett and A. C. Roe. \$3.00. 302 pages, 6x9, cloth-bound, McGraw-Hill Book Co., Inc.

AGAINST CONTROL OVER CO-OPS

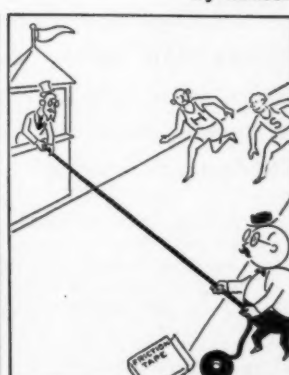
Strong opposition to the movement to vest control of rural electrification co-operatives in state regulatory bodies has been voiced by Morris L. Cooke, just resigned as Administrator of the Rural Electrification Administration, in a letter addressed to Senator Guy M. Gillette of Iowa. Such control, according to Mr. Cooke, is not only unnecessary, but is positively detrimental to the drive to make electric power more widely available in rural areas.

Commission control, he says, has two functions: to intervene between the buyer and seller of power regarding rate matters, and to supervise the issuance of utility securities. Since, under the cooperative set-up, the buyer and seller are identical, and since cooperatives sell no securities to the public, regulatory commissions have no functions to perform in respect to such organizations.

"But," writes Mr. Cooke, "the fact that there is no need for commission intervention is not the whole story. . . . Too often we have witnessed the phenomenon of a farm group which has given up hope of

A. Livewire, Contractor

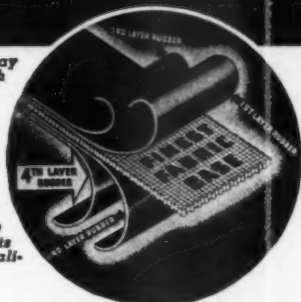
By Scheel





Tear it down the **MIDDLE . . .**

You never pay for the fourth layer of rubber on DUTCH BRAND Friction Tape. It's this fourth layer that gives DUTCH BRAND many of its unusual qualities.



● Will DUTCH BRAND Tape zig-zag when you tear it down the middle? Positively not! It tears as straight as the blade on your razor. That's proof that it is cut true . . . and tape cut true will never ravel!

It means an additional step in production to make DUTCH BRAND'S true cut tape, but it

is one of the several 'extras' that have made DUTCH BRAND'S quality outstanding. You won't have to pay more for this fine quality tape, that sticks tight on both sides, that resists 2000 volts instead of only 1000 and has double the life of an ordinary product. Why don't you use it too . . . at the same price?

DUTCH BRAND Friction Tape, Rubber Tape and Soldering Paste are sold by electrical jobbers everywhere.

VAN CLEEF BROS. Established 1910
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Woodlawn Avenue, 77th to 78th Streets
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Rubber Insulating Tape
Fuses instantly without heat. Molds into one solid piece. It stretches without breaking because it contains more live, new rubber. Approved by Underwriters Laboratories.

Standard Packages—The Nos. 8, 4, 2 and 1 sizes are all available in the well known orange and blue individual and display cartons and metal counter dispensers for retail sale.

The Jumbo Package Contains 10 standard No. 8 rolls. The economical way for repairmen, electrical contractors and industrial users to purchase Friction Tape where individually cartoned tape is not required.



DUTCH BRAND *Friction Tape*
EXCEEDS THE QUALITY SPECIFICATIONS OF THE A. S. T. M.

High Lights IN THE NEWS

[FROM PAGE 92]

obtaining service from the franchise-holding utility and sought to provide itself with service, stopped in its tracks by the claim that the utility has some sort of sovereign rights on the area. . . . To approach a "freezing" of the territorial allocations or "rights" would be to halt the march of electricity to the farm. Yet the process of protesting such a manifestly unfair claim regularly calls forth batteries of high-priced legal and engineering talent to defend the claims of the utility before the commission. A cooperative cannot afford any such array and hence runs a real risk of losing out, irrespective of the common sense realities of the situation."

Turning to commission control over rates, Mr. Cooke stated: "There is a natural tendency for these quasi-judicial bodies to want to see uniformity in rates charged. . . . They are more or less inevitably forced to regard uniformity of rates as an indication that the public is being fairly treated, or at least that no part of the public is enjoying an undeserved advantage. . . . I foresee a tremendous and sustained pressure to have farmers, as members of cooperatives, charge themselves the same rates for electricity as the private companies are permitted to charge farmers in other areas. . . . Cooperatives do not have the overhead of private utilities and they are not seeking to make a profit, so it is reasonable to suppose that they will be able to serve themselves at somewhat lower rates than those which now prevail in most areas. Commission control would seriously retard the downward course of rate levels. . . ."



25TH. YEAR—The H. N. Crowder Jr. Co.'s Silver Anniversary was celebrated on January 21, 22 and 23 at Allentown, Pa., by holding a power and industrial show in its recently enlarged quarters. The brothers H. N. Crowder, jr., (left) and C. F. Crowder were well pleased with the way customers turned out to see exhibits of 30 prominent manufacturers and to inspect the company's modernized motor service shop.

COURSE ON LIGHTING

Alvin L. Powell, past president of the Illuminating Engineering Society, will give a course on "Illumination of Buildings" at Columbia University during the Spring session. Special lectures by Miss L. E. Eddy, L. J. Buttolph, R. E. Clisdell, T. C. Lindholm, R. G. Morison, and K. Staley have been arranged. The instruction, sponsored by the Departments of Electrical Engineering and Architecture, is intended for architects and others interested in the uses and possibilities of commercial, residential, and decorative lighting.

More GOSSIP

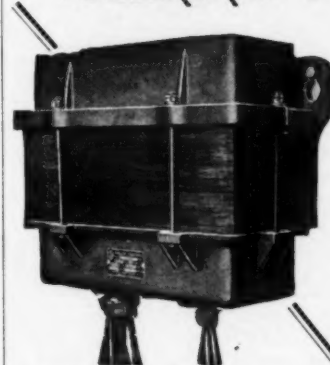
Manhattan Merger

Fred Nachtigall who operated an electrical contracting business under his own name in Manhattan for about 12 years, recently became a member of the firm of Mullikin & Dietrich, Inc., New York City.

Wire Fire

A nice re-wiring job of about \$5,000 is going on after fire recently damaged a store in Youngstown, Ohio. Some new wiring that was added to the old system is suspected to have caused the fire. And George N. Sandquist of General Wiring Co., who has the present job, recalls that

If you want Transformers of up-to-date design specify AMERTRAN . . .



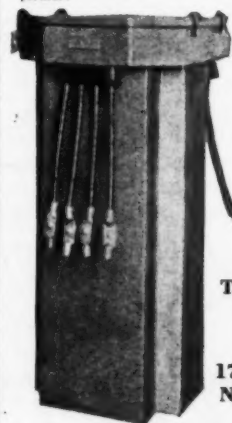
AmerTran Type CFT three-phase, outdoor-type, air-cooled transformer.

FOR 35 years AmerTran has concentrated exclusively on the manufacture of transformers—has equipped itself fully with experience, engineering skill and manufacturing facilities.

AmerTran Transformers are up-to-date in every particular, incorporate many exclusive advantages, and are of highest quality construction. Standard and special types are available for every industrial application.

May we send complete data?

AmerTran Type RS single-phase, oil-immersed distribution transformer.



**AMERICAN
TRANSFORMER
COMPANY**

**175 EMMET ST.
NEWARK, N. J.**

LIVE Wires that *live long*



EVERY quality demanded of building wire is found in its highest form in Americore, Amparak, Amerite and Amperox Performite—all made by American Steel & Wire Company. These building wires and cables are supplied in all standard colors; are clean to handle, and save time and effort because they "pull" easily.

Once installed these wires are sure to give many years of service. They are impervious to moisture, will not crack with cold or soften with heat. Americore, Amparak, Amerite and Amperox Performite are all protected with the patented Safecote finish which adds to their safety, economy and endurance. Thus protected they will not carry nor support flame.

We will be glad to provide you with samples that will demonstrate for themselves that these long lasting building wires can serve you better and more economically.

AMERICORE

(Code)

AMERITE

(30%)

AMPARAK

(Intermediate)

AMPEROX PERFORMITE

(U. S. Govt. "Superaging-Grade")



ELECTRICAL WIRES *and* CABLES

AMERICAN STEEL & WIRE COMPANY

208 South La Salle Street, Chicago

Columbia Steel Company, San Francisco, Pacific Coast Distributors



Empire State Building, New York

United States Steel Products Company, New York, Export Distributors

UNITED STATES STEEL

The easiest way to get ahead in electricity—
through the other man's
experience as found in books



Whatever "getting ahead" means to you as an individual, there is no principle so important as backing up your brain with the other man's experience. Why spend time and effort to find out what has already been learned and put down for all to see in books? Here, for instance, are all the results of a rich experience in every stage of wiring, installation and contracting work gathered and set down for you in

Terrell Croft's AMERICAN ELECTRICIANS' LIBRARY

(6 volumes—over 2,000 pages—fully illustrated)

In six really magnificent volumes this library gives the most thorough, most complete and easiest-to-understand treatment of the more specialized phases of electrical practice in print today.

"How" and "why" for Maintenance Men
The books show the best ways to make installations for every type of conduit wiring job—they tell how to handle every kind of lighting and switch problem—they give tips on shortcuts for saving time on routine jobs—they show the quickest and surest methods of locating and remedying circuit troubles. Alternating current armature winding, electrical machinery control diagrams and machinery erection are some of the things covered in detail.

Diagrams

In all, these books contain more than 1,000 clear, easy-to-follow diagrams, with wiring instructions written in simple language. It is unnecessary to tell you how valuable is this one feature alone.

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You may examine these books free for 10 days by sending the coupon below, filled out. In addition, if you decide to keep the books you have the privilege of paying for them in easy monthly installments while you use the books. Make sure you are not passing up your best bet for getting ahead. Mail the coupon today.

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Send me Croft's American Electricians' Library, 6 volumes, for 10 days' free examination. If I find the books satisfactory, I will send you \$1.50 in 10 days, and \$2.00 a month until \$17.50 has been paid. Otherwise I will return the books postpaid.

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Position

(Books sent on approval in U. S. and Canada only.)

More GOSSIP

[FROM PAGE 94]

some kind of a license-loaning deal was said to have been made when this store's wiring was added to before the fire took place. More reasons for contractors to emphasize the services of qualified contractors.

For Decoration

An impressive arrangement of lighting equipment is displayed with wall paper and paint stocks by Rusterholtz, Inc., Erie, Pa. This business is the outgrowth of what was originally an electrical contracting concern, but has now become a large business in interior decoration.

Front Names

Customers ask for "Cort," "Art" or "Jim," in dealing with the Erie Electric Motor Repair Co., Inc., of Buffalo, and like it. The neat tan uniforms worn by the shop crew bear each man's first name on the blouse pocket in addition to the company's name on the back. It helps make friends.

MOVING TIME FOR OLD-TIMERS

All that remains in this large engine-generator room is the 200 kw. engine generator in the left foreground, used for operating d.c. crane motors. Old foundations are being leveled for a new 50-ft.



MAKING WAY—Steam engines and generators dismantled in the modernization of a large Chattanooga foundry.

main distribution switchboard, that is to be energized from two outdoor transformer stations, which have replaced an obsolete and overloaded steam plant in a Chattanooga, Tenn., pipe foundry.

The job of rearranging and enlarging the wiring system is being taken care of by the Terrell Electric Company. About \$40,000 is being spent for modern wiring.

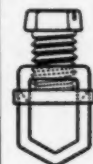
SIMPLE, ISN'T IT?

ILSCO



SOLDERLESS CONNECTOR

NOTICE: The triangular wedge formed by the tang and V-bottom collar, which forces the wire into a solid mesh—



- NO set-screw contact . . .
- NO flattening or separating of wires . . .
- NO limitation to one size wire . . .
- NO shearing effect whatsoever . . .
- NO special tools required to make connection . . .

NO need for you to search any longer for the PERFECT Solderless Connector—WE HAVE IT!



IlSCO solder lugs show the size of the largest wire they will take.

FREE—A large display board, containing mounted samples of ILSCO lugs. Sent upon request.

ILSCO COPPER TUBE & PRODUCTS, INC.
5629 Madison Road. Cincinnati, Ohio

A CONNECTION



IS SO



EASY with

The MARR
A Perfect Joint Connector

(COP MADE OF BRASS/STEEL)

Prove to yourself that
you can save time and do
a better job with MARR

**A POST CARD BRINGS
FREE SAMPLES**

App'd by Underwriters

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552 STATE STREET
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GENERAL SALES AGENTS HATHEWAY AND CO.
229 CHURCH STREET NEW YORK, N. Y., U. S. A.

Electrical Contracting, March 1937



Weatherproof Switch, Receptacle

These devices defy the weather at outside entrances, on porches, in patios, for operating *outdoor* lights or appliances. The Switch No. 7981 has completely enclosed mechanism. Its cadmium-finished brass plate fits over a rubber mat, weather-tight. Operated by a handy indicating lever. Fits any standard wall box; comes in single-pole, double-pole, 3-way and 4-way types. Complete listings in data-sheet on request.

The Receptacle No. 7792 provides for plugging-in lights on porches or terraces, for Holiday tree or lawn lighting and for operation of *outdoor* appliances. Saves nuisance of temporary wiring from inside. Has cadmium-finished brass plate, fitting on rubber mat, with metal cap to screw over receptacle opening when not in use. When connected, the regular plug cap may be covered with metal Cap No. 7793.

SOLD THROUGH YOUR

ARROW ELECTRIC DIVISION

ELECTRICAL WHOLESALER

THE ARROW-HART & HEGEMAN ELECTRIC CO. HARTFORD, CONN.

Electrical Contracting, March 1937

97

News of NECA



35
YEARS
AGO

TO PLAN

COORDINATED SELLING

Representatives of all branches of the electrical industry from the eight southeastern states will meet in an Industry Conference at the Biltmore Hotel in Atlanta, Georgia, on Monday and Tuesday, March 15th and 16th. The purpose is to formulate a coordinated industry selling program that will reach every phase of the electrical market.

This Industry Conference will carry out the principles laid down by the Electrical Industry Promotion Committee for the enlistment of every electrical interest in a coordinated selling drive. Outstanding industry speakers have accepted the invitation to address the Conference. Speakers already announced are the following:

Preston S. Arkwright, President, Georgia Power Company, Chairman of the Conference; Earl N. Peak, President, NECA, Chairman, Electrical Industry Promotion Committee; C. E. Swartzbaugh, Chairman, Business Development Committee, N.E.M.A., Vice-Chairman, Electrical Industry Promotion Committee, President, Swartzbaugh Mfg. Co., Toledo; Lawrence W. Davis, General Manager, NECA; Ralph Neumuller, President, International Association of Electrical Leagues, Executive Vice-President, Electrical Association of New York, Inc.; Earl Whitehorne, Editor, Electrical Contracting.

The keynote of this Conference will be "to establish in trading centers, coordinating local groups made up of representatives of all branches of the electrical industry for the purpose of securing better cooperation in the industry in business development activities." Plans will cover every phase of market development—adequate wiring, industrial lighting, plant modernization and sales promotion in all electrical merchandising fields.

NECA DISTRIBUTES WIRING HANDBOOK

The long-awaited Handbook of Interior Wiring Design, which has been developed by a joint industry committee over the

past year and a half, has now been received from the printers. It is being distributed by NECA to all of its members. The Handbook, consisting of 80 pages, 8½" x 11" in size, has been excellently printed so as to make available, in readily usable form, the wiring design standards developed by the industry committee.

One copy of the handbook will be sent without charge to every member of NECA and to each new member joining NECA during the coming year. Additional copies may be purchased by members or non-members at the following prices:

1 to 4 copies	\$1.00 each
5 to 9 "	.50 "
10 to 50 "	.35 "

(Prices on larger quantities upon request)

SYRACUSE JUNIOR EXECUTIVES

Two of Rochester's active electrical men keep the pioneer firm of T. H. Green Co., Inc., busy. Here we have Ray F. Hornbeck, vice president, and Herb F. Janick, (right) secretary-treasurer. Both men have given everything they have to sell the quality idea backed by this company's 40-years business history in New York state.

Mr. Hornbeck has charge of motor repairs and special lighting equipment manufacture. Customers are willing



Rochester Men—Ray F. Hornbeck and Herb F. Janick of T. H. Green Co., two successful contractors, both local cooperators.

ELECTRICITY as She Is, by "Funnygraph" cites six on-the-job sparks of wisdom. The feature item tells of three contractors discussing high-frequency and low-frequency 60 cycle transformers.

Trade notes include reports of ten generators sold by Crocker Wheeler totalling 1,275 k.w., and twenty-three by Sprague, totalling 495 k.w.

Press headlines, "Due to Defective Electric Wiring," are viewed with alarm as harmful to industry. An expert on illuminating gas submits debunking paper on leaks in mains and terrific gas explosions, that have been occurring around New York.

Merit system of pay for workmen discussed, as against unfairness and disadvantages of attempts to establish piece-work schedules.

Local lighting for mills and factories featured in display ad of Morse automatic cord adjuster, for use on drop cords with Webster any-angle adjuster for cone shades.

YOUNGSTOWN



HOT GALVANIZED ELECTRO GALVANIZED

YOUNGSTOWN produces the four types of conduit listed above under conditions of intensive metallurgical control and rigorous inspection which assure uniformity in analysis, ductility

BLACK ENAMELED ELECTRICAL METALLIC TUBING

and finish. The "workability" of Buckeye Conduit thus maintained enables journeymen to make installations which add to a contractor's reputation for quality workmanship.



THE YOUNGSTOWN SHEET AND TUBE COMPANY

Manufacturers of Carbon and Alloy Steels
General Offices - YOUNGSTOWN, OHIO
671

Sheets; Plates; Pipe and other Tubular
Products; Conduit; Tin Plate; Bars; Rods;
Wire; Nails; Unions; Tie Plates
and Spikes



"Conduit in the raw" - molten steel
pouring from Bessemer converter



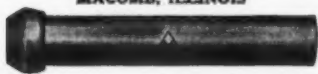
For Residence Wiring

The Best and Safest Method is a properly installed KNOB and TUBE job. Be sure and get the

Bull Dog
REGISTERED

Assembled Knob because it "HAS A GRIP LIKE ITS NAMESAKE."

ILLINOIS ELECTRIC PORCELAIN CO.
MACOMB, ILLINOIS



THE

Badger

50 AMPERE

Synchronous TIME SWITCH

... dependable
... at low cost

Here is a time switch that you can depend upon to give absolutely satisfactory service.

Sell quality and eliminate costly service calls.



See your wholesaler or write for complete descriptive literature.

RELANCE AUTOMATIC LIGHTING CO
1937 Mead Street Racine, Wis.

News of NECA

[FROM PAGE 98]

to pay more, he says, for good motor work done with highest grade materials. Herb Janick is an association worker of wide acquaintance, having served for 12 years as secretary of the New York Electrical Contractors Association.

FLORIDA CONVENTION

The program for the annual convention of the Florida Association of Electrical Contractors and Dealers, to be held at the San Juan Hotel, Orlando, Fla., will start with an Executive Committee meeting on Sunday, March 7th at 2 P.M. Convention sessions will be held on Monday and Tuesday, March 8th and 9th, with State President J. J. Newell presiding. The list of speakers includes the following men:

Earl N. Peak, President, NECA.

Ralph M. Walker, Executive Committeeman, Southern Division.

Ernest E. Anders, Commissioner of Public Utilities, Jacksonville.

Prof. Joseph Weil, University of Florida, Gainesville.

R. Bourke Corcoran, Uniform Legislation Department, NEMA.

A. Penn Denton, Rigid Steel Conduit Association.

F. S. Godell, Wiring Device Section, General Electric Co.

Samuel G. Hibben, Westinghouse Lamp Co.

Group meetings have also been arranged by the State organizations of electrical inspectors and electrical wholesalers. One of the most interesting sessions of the convention will be a joint meeting of the electrical contractors, motor dealers and repair men with the electrical inspectors, wholesalers, manufacturers and utilities.

NEW NECA MEMBERS

In the first six weeks of this year, 32 new members were accepted for membership in NECA. Upon enrollment each new member receives all membership services available to NECA members, including—NECA Manual of Labor Units (With monthly Estimating Data Service); Electragists' Estimating Manual, Simplified Business Record System, Handbook of Interior Wiring Design, Survey of Prevailing Wage Rates in 1000 Cities, NECA Monthly Bulletin, "Qualified Contractor", Subscription to *Electrical Contracting* Magazine, Identification as a *Qualified Electrical Contractor*.

Bulletins on the following subjects are available also, on request—Voluntary

Agreement of Fair Competition, Plan of Bidding Practice, Social Security Bulletins, Information on Licensing and Inspection Laws, Directory of Local Contractors Association, Organization and Operation of Local Associations.

Advisory service on business problems of all sorts and the services of NECA committees on questions affecting industry relations and matters of national interest are further benefits of membership.

OTHER CONFERENCES IN THE SOUTH

Earl N. Peak, President of NECA, and Ralph M. Walker, NECA Executive Committeeman and Chairman of Distribution Committee, will visit cities in Georgia and Florida, during the week prior to the Florida State Convention at Orlando. Meetings of electrical contractors with local industrial leaders have been arranged in—Savannah,—March 2; Jacksonville,—3; Miami,—5; Tampa,—6.

Following the Orlando convention, President Peak will go to Atlanta for the Southeastern Industry Conference.

NEW OFFICERS IN JACKSONVILLE

The Jacksonville NECA Chapter, at its annual meeting in February elected the following new officers for the ensuing year:

W. O. Henderson, President.

Rudy Baache, Vice-President.

L. L. Hunt, Secretary-Treasurer.

The Jacksonville Chapter is composed of 25 NECA members, constituting 94 per cent of the electrical contractors in Jacksonville. In addition, they have 25 associate jobber, dealer and utility members.

PEAK PLANS WESTERN TRIP

Plans have been announced by NECA Headquarters for a western trip to be made during April by Earl N. Peak, President of NECA and Chairman of the Electrical Industry Promotion Committee. The itinerary as tentatively announced includes the following principal cities, where industry meetings are being arranged:

Omaha, Neb.	April 5
Los Angeles, Cal.	April 8-9
Fresno, Cal.	April 10
San Francisco, Cal.	April 12-13
Portland, Ore.	April 15
Seattle, Wash.	April 16-17
Salt Lake City, U.	April 19
Denver, Colo.	April 21-22

Material for this department is supplied by the headquarters staff of the National Electrical Contractors Association, 420 Lexington Avenue, New York.

With the MANUFACTURERS

David T. Wadsworth Dies

Another pioneer contractor has passed away. David T. Wadsworth, vice-president and chief engineer of the Wadsworth Electric & Manufacturing Company of Covington, Ky., died in Louisville, where he was attending a recent meeting of the Kentucky Chapter, Western Section, of the International Association of Electrical Inspectors.

Mr. Wadsworth was born March 13, 1870 in Cold Spring, Ky., and entered the electrical industry with the Cincinnati Traction Company. Later with his brothers, he founded one of the first firms to engage in the electrical contracting business in that vicinity. Then he became an insurance inspector, and in 1922 entered the electrical manufacturing field, with the company he served until his death.

Mr. Wadsworth was credited with numerous inventions and developments in the electrical field and was regarded as a national authority on many phases of the electrical business. In 1934, at an electrical convention in Cincinnati, he was presented with a bronze plaque, by the Governor of Kentucky, commemorating his fiftieth anniversary in the electrical industry.

Eugene P. Farris has been appointed manager of specialty sales of the Emerson Electric Mfg. Co., St. Louis.

Harold A. Olson has been appointed manager of the North Pacific Division of the Incandescent Lamp Department of General Electric Company, with headquarters at Portland, Ore. He was formerly assistant manager of the Buckeye Division in Cleveland.

The Ideal Commutator Dresser Company of Sycamore, Ill., manufacturers of electrical products, announces the purchase of the Marshall Electric Co. of Elkhart, Indiana, manufacturers of automatic voltage regulators. Operations of the Marshall Electric Co. will be transferred as rapidly as possible to Sycamore. The Ideal Commutator Dresser Co. will continue to manufacture and develop the full line.

Flood Service

In order that the impaired electric service in the flooded Ohio Valley may be restored as quickly as possible, the General Electric Co. of Schenectady, shipped 35 carloads of repair parts and materials from stock in its Pittsfield, Mass. plant to the warehouse of its district office in Cleveland. Men and supplies for relief activities are concentrated there.

James J. Backer has been appointed sales representative for the Northwestern territory of the Aerovox Corporation of Brooklyn, N. Y. His headquarters will be 109 Bell St., Seattle, Wash.

Benjamin P. McKinley, at one time works manager of the Bryant Electric Co., and vice-president of the Hemco Electric Co., Bridgeport, Conn., has been appointed general sales manager of the Palmer Electric & Manufacturing Co., Waltham, Mass.

Lincoln Electric Company of Cleveland has announced the appointments of Robert A. Wilson, A. T. Cox, Jr., and George Mandula to the sales staff of its Chicago office, 1455 West 37th Street.

Allis-Chalmers Manufacturing Co., Milwaukee, Wis., announces the appointment of L. H. Hill as engineer-in-charge of their Transformer Division, of which he has been assistant engineer-in-charge since 1931.

Price Control On Rigid Conduit

Over a period of many years the rigid steel conduit industry has sold a large majority of its product on a consigned stock basis. This method of selling is an established custom. During the past several years many manufacturers, with large

consigned stocks, have had their investments jeopardized by highly competitive conditions in which these stocks have sometimes been sold at cost or below cost by their consigned stock agents.

Recently the National Electric Products Corp. of Pittsburgh decided to exercise a full and complete control of the price at which its products are sold, and has taken steps to establish minimum prices, terms and conditions based upon a study of the cost of distribution of conduit. This company has established regulations pertaining to method of eliminating fraud, through contracts intended to protect the contractor on advancing markets, where he has firm contracts calling for the consumption of conduit in specific buildings and is subject to a loss. Since then several other companies have taken similar action.

Ajax Flexible Coupling Co., of Westfield, N. Y., has opened a new sales office in Louisville, Ky. Alfred Halliday will handle the Ajax line, with headquarters in the Starks Bldg.

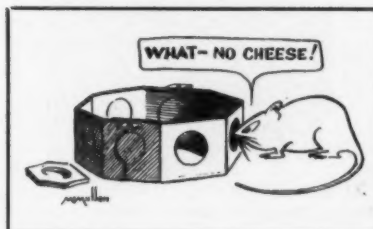
J. B. Higgins has been appointed sales representative in Michigan for the Schwarze Electric Company. He will have offices in the Morgan Bldg., Detroit.

W. R. Smith has been appointed to the sales staff of the Los Angeles office of the Lincoln Electric Company.

Machine Tool Electrification Forum

In response to many requests, Westinghouse Electric and Manufacturing Company will sponsor a second Machine Tool Electrification Forum at its East Pittsburgh Works April 19-22. The forum will discuss "New Methods and Designs for Machine Tool Electrification." The increasing demand of industry for more accurate and finer control should make this meeting of interest to all machine tool manufacturers.

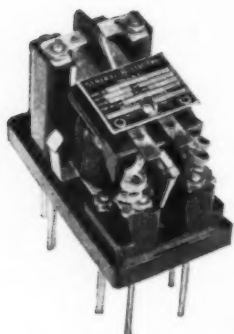
Papers on the subject of special and difficult problems will be presented by representatives of machine tool builders as a special feature of the forum. Talks will also be given by Westinghouse works, application and design engineers. Inspection trips through the East Pittsburgh and Nuttall Works will be included in the program.



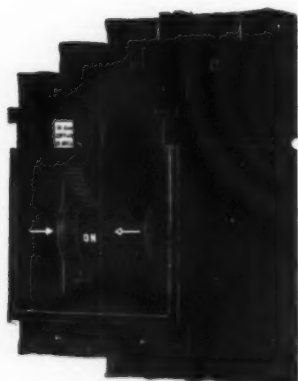
Equipment NEWS



WAKEFIELD DROP LIGHT



GENERAL ELECTRIC RELAY



HEINEMANN CIRCUIT BREAKER

"Catchon" Downlight

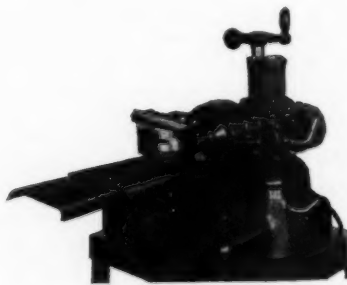
A fixture to modernize dropcord lighting, provides aluminized reflector with open bottom fitted with a louvre. Throws light upon ceiling and also high intensity directed downward. No glare, light in weight, screws into dropcord socket. F. W. Wakefield Brass Company, Vermillion, Ohio.

Auxiliary Relay

The new HGA auxiliary relay opens and closes a circuit on either a.c. or d.c. Made in double pole arrangement with either two or four contacts, can be furnished with the operating coil for one to five amp. d.c.; 6, 12, 24, 32, 48, 125 and 250 volts d.c.; or 115, 230, 460 and 575 volts a.c. By adding an external resistor can also be used on higher voltage d.c. circuits. General Electric Co., Schenectady, N. Y.

Re-Cirk-It Breaker

Magnetic and non-thermal units available in instantaneous and time-delay types, any ampere rating from 50 milliamperes up to 35 amperes. Choice of three poles, overload coils, shunt-trip coils. Tumbler handle for switching current. Available in open types, enclosed bakelite cases for mounting on machines or panels, in bakelite enclosed types for panel groups, and steel safety cabinets, also heavy castmetal housing for service in inflammable and explosive locations. Heinemann Electric Co., Trenton, N. J.



OSTER CHASER GRINDER



STANLEY DRILL

Electric Drill

Half inch capacity "Victor" Drill designed for wood and metal drilling. Heat treated nickel steel gears, universal motor mounted on seal type ball bearings, aluminum alloy housing and three-jaw chuck, combination spade and breast plate handle. No. 124 "Victor" Drill weighs 12½ lbs. and 15½-in. long. Stanley Electric Tool Div., The Stanley Works, New Britain, Conn.

Industrial Toggle Switch

Slow break toggle switch for use on machines, heavy duty appliances, equipment using fractional horsepower motors and special lighting circuits, for a.c. only. Available in two or three position, for flush mounting in standard boxes, for interior or exterior mounting as part of machine equipment. Made of molded bakelite or surface type metal boxes for industrial applications. Hart Manufacturing Co., Hartford, Conn.



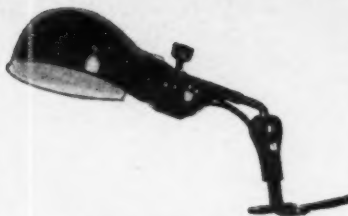
HART TOGGLE SWITCH

Chaser Grinder

A small and compact grinder for threading dies and chasers of all kinds. Standard equipment consists of one set of special fixtures and wheels for grinding any one type of chaser; universal motor and dressing stick for grinding wheels. Oster Manufacturing Co., Cleveland, Ohio.

Machine Lamps

Short coupled Fostoria machine lamps for installation where space is limited. No. 12 uses up to 60 watt bulb. No. 12C with 15 and 25 watt bulbs. Both units attached to stamped base with two holes for mounting and assembled to short tube. Assembled complete with key socket, 4-ft. rubber cord and plug. Furnished in dark green or machine grey. Fostoria Pressed Steel Corp., Fostoria, Ohio.



FOSTORIA MACHINE LAMP

Thermal Switch for Motors

The "thermotector," a thermal overload switch for fractional-horsepower motors, is an automatically reset thermal overload switch operating on line current of motor and arranged for convenient mounting on motor terminal box. Automatically disconnects motor from line before motor reaches dangerous temperature and reconnects when motor cools. General Electric Co., Schenectady, N. Y.



GENERAL ELECTRIC MOTOR SWITCH

Packard Welder

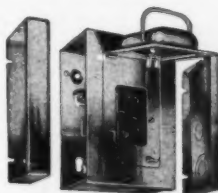
Mounted on two 16-in. wheels, with a handle for convenience of transportation. Housed in weatherproof frame, allowing circulation of cooling air. Bakelite control panel, with settings for various arc lengths, attached to cover on handle end, together with switch for rapidly changing from 110- to 220-volts. Features are frequency weld, shading-pole, carbon rods for brazing and soldering, Master Vibrator Co., Dayton, Ohio.



MASTER WELDER

Pullout Troughing Switch

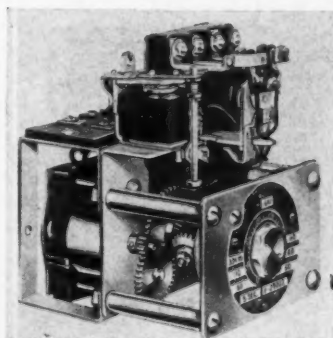
This 30-amp. entrance device with accessible load side fuses for apartment house installations. Switching action obtained by opening and closing cover. Designed for close banking. Endwalls are removable. Two or more switches can be connected forming one continuous trough, in which all wiring may be accomplished. Fuse receptacles and connections mounted on unit block. Ample wiring space between wall and cabinet. Colt-Noark Division of Colt's Patent Fire Arms Manufacturing Co., Hartford, Conn.



COLT ENTRANCE SWITCH

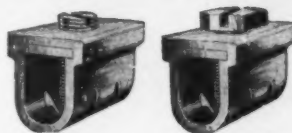
Time Delay Relay

Motor driven time delay relay for 60 cycle a.c., 110 and 220 volt operation. Consists of small synchronous motor, gear train, pivoted tripping arm and magnetically operated brake. Immediate recycling. Quick make and break. Various time ranges. Load contact combinations include double pole, double throw. Ward Leonard Electric Co., Mount Vernon, N. Y.



WARD LEONARD RELAY

Sherman Wedge-Grip Connectors



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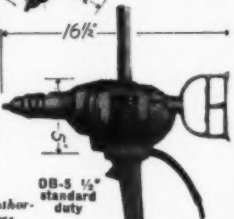
OB-8 1/4" light duty drill is designed for intermittent service. Light in weight, it is especially adaptable for radio repair work, wood and metal assembly and similar light work.



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Utility Nipple



An offset nipple* which permits mounting of switches, gutter outlet boxes and other equipment where knockouts don't line up. Sizes available are 1/2, 3/4, 1 1/4, 1 1/2 and 2 in. All are the same length, 1 1/2 in. between shoulders.

B. HARTMAN

168 Sunset Street

Long Beach, Calif.

* Patent applied for.

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